Wave Guide for 5-148

INSTRUCTION BOOK

for

ANTENNA COUPLER CU-52/URR

MANUFACTURED BY
WICKES ENGINEERING & CONSTRUCTION COMPANY
ORDER NO. 13520-PHILA-51
28 APRIL 1952

INSTRUCTION BOOK

for

ANTENNA COUPLER CU-52/URR

MANUFACTURED BY
WICKES ENGINEERING & CONSTRUCTION COMPANY
ORDER NO. 13520-PHILA-51
28 APRIL 1952

21 July 1952

ADDENDA 1 TO

INSTRUCTION BOOK

for

ANTENNA COUPLER CU-52/URR

(TM 11-5056 IB)

The information in this instruction book applies also to the equipment procured on Order No. 6433-P-51.

Page 63. Par. 80a(8). Line 5. Change "not less than unity" to read: not less than 1.5.

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

Be careful not to contact high-voltage connections or the 115- or 230-volt connections when working on or near this equipment. When working inside the equipment, after the power has been turned off, always short-circuit the high-voltage capacitors.

CONTENTS

		Paragraphs	Pages
CHAPTER 1. INTRODUCTION.			
Section I.	General	1-2	1
II.	Description and data	3-11	1-5
CHAPTER 2. OPERATING INSTRUCTIONS.			
Section I.	Service upon receipt of equipment	12-21	7-14
II.	Controls	22-23	15
III.	Operation under usual conditions	24-25	15
IV.	Operation under unusual conditions	26-29	15-16
CHAPTER 3. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS.			
Section I.	Organizational tools and equipment	30-31	17
II.	Preventive maintenance services	32-35	17-21
III.	Lubrication and weatherproofing	36-38	21
IV.	Trouble shooting at organizational maintenance level	39-42	21-23
CHAPTER 4. THEORY		43-60	24-40
CHAPTER 5. FIELD MAINTENANCE INSTRUCTIONS.			
Section I.	Trouble shooting at field maintenance level	61-70	41-55
II.	Repairs	71-72	56
III.	Final testing	73-81	57-68
CHAPTER 6. SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE.			
Section I.	Shipment and limited storage	82-83	69
II.	Demolition of materiel to prevent enemy use	84-85	69
APPENDIX I. REFERENCES			70-71
II. IDENTIFICATION TABLE OF PARTS			72-85
INDEX			86-88

LIST OF ILLUSTRATIONS

Fig. No.	Title	Page
1	Antenna Coupler CU-52/URR	viii
2	Antenna Coupler CU-52/URR, system block diagram	2
3	Antenna Coupler CU-52/URR, operating and spare components	3
4	Antenna Coupler CU-52/URR, chassis layout	6
5	R-f transformer Z23, terminal board connections	9
6	Balanced cable fabrication diagram	10
7	Unbalanced cable fabrication diagram	12
8	Antenna Coupler CU-52/URR, front panel	14
9	DA AGO Form 11-238, sample form	18
10	DA AGO Form 11-239, sample form	20
11	Antenna Coupler CU-52/URR, block diagram	26
12	R-f transformers, functional diagrams	28
13	Input amplifier stage, functional diagram	30
14	Interstage amplifier, functional diagram	31
15	Basic filter sections, schematic diagram	32
16	Interstage filters Z1 to Z7, functional diagrams	34
17	Interstage filters Z8 to Z16, functional diagrams	35
18	Transmission line amplifier and artificial transmission line, functional diagram	36
19	Phase inverter, functional diagram	37
20	Output amplifier stage, functional diagram	38
21	Power supply and control circuits, functional diagram	39
22	Antenna Coupler CU-52/URR, top view	50
23	Main chassis, top view	52
24	Main chassis, bottom view	54
25	Input amplifier chassis, top view	55
26	Input amplifier chassis, bottom view	56
27	Input amplifier chassis, bottom view	56
28	Output amplifier chassis, top view	57
29	Output amplifier chassis, bottom view	58
30	Output amplifier chassis, bottom view	58
31	Power supply chassis, top view	60
32	Power supply chassis, bottom view	60
33	Power supply chassis, voltage and resistance diagram	62
34	Main chassis, voltage and resistance diagram	64
35	Output amplifier chassis, voltage and resistance diagram	65
36	Input amplifier chassis, voltage and resistance diagram	66
37	B+ voltage distribution diagram	67
38	Test set-up diagrams	68
39	Capacitor color and letter codes	89
40	Resistor color and letter codes	90
41	Antenna Coupler CU-52/URR, schematic diagram	91
42	R-f transformers, schematic diagrams	93
43	Interstage filters, schematic diagrams	95

First Aid for Electric Shock

RESCUE.

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

SYMPTOMS.

a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

TREATMENT.

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only,* remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth-to-mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such manner that:

(*1*) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;

(*2*) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;

(*3*) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;

(*4*) the operator's elbows are straight and locked.

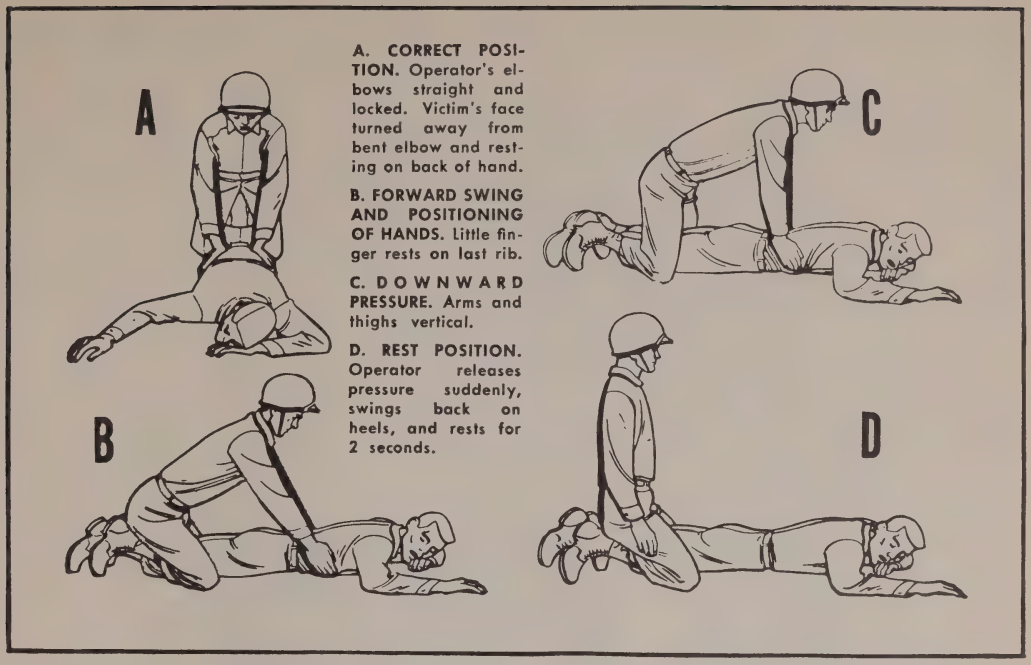
f. The resuscitation procedure is as follows:

(*1*) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(*2*) Swing back, suddenly releasing pressure, and sit up on the heels.

(*3*) After 2 seconds rest, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4



A. CORRECT POSITION. Operator's elbows straight and locked. Victim's face turned away from bent elbow and resting on back of hand.

B. FORWARD SWING AND POSITIONING OF HANDS. Little finger rests on last rib.

C. DOWNWARD PRESSURE. Arms and thighs vertical.

D. REST POSITION. Operator releases pressure suddenly, swings back on heels, and rests for 2 seconds.

seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

RELIEVING OPERATOR.

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

STIMULANTS.

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostril for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

CAUTIONS.

a. After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

b. keep the victim lying flat on his back, with his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

c. A resuscitated victim must be watched carefully as he may suddenly stop breathing. *Never leave a resuscitated person alone until it is CERTAIN that he is fully conscious and breathing normally.*

TL 15338-E

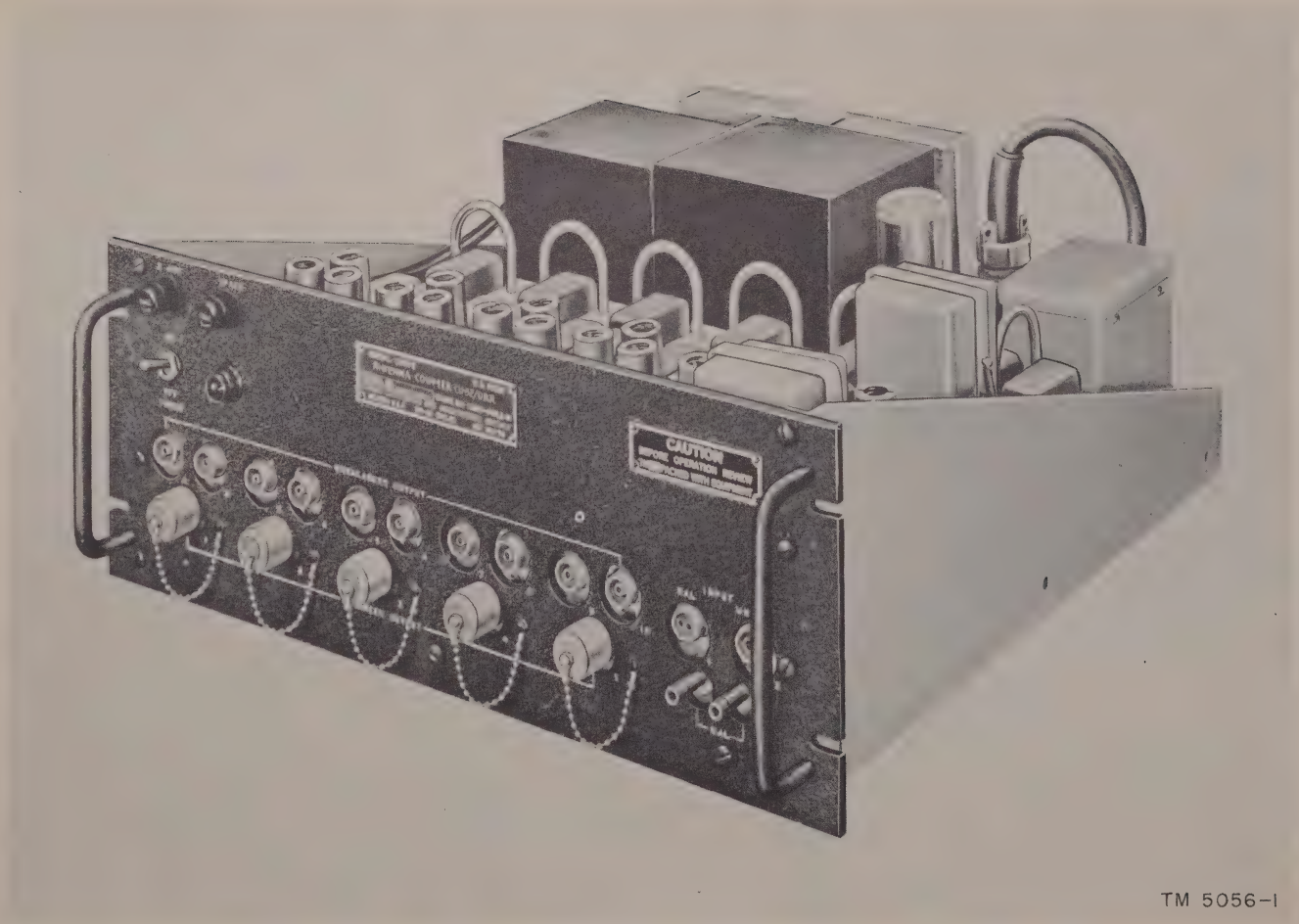


Figure 1. Antenna Coupler CU-52/URR.

Note. This instruction book will be replaced by TM 11-5056 which, when published, will be listed in SR 310-20-4.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This instruction book contains instructions for the installation, operation, maintenance, and repair of Antenna Coupler CU-52/URR. In addition to these instructions there are two appendixes covering a list of references and an identification table of parts.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army materiel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5.

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

c. DA AGO Form 11-238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 9).

d. DA AGO Form 11-239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 10).

e. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Antenna Coupler CU-52/URR (fig. 1) is a broadband coupling device designed to permit operation, from a single antenna and with a minimum of interaction, of 1 to 10 radio receivers having unbalanced antenna input circuits or 1 to 5 radio receivers having balanced antenna input circuits. Combinations of receivers having either balanced or unbalanced input circuits can be used also.

b. The antenna coupler provides a suitable impedance match for the antenna system, independent of the receiver input impedance, over the frequency range of .1 mc to 24 mc (megacycles). One of the eight plug-in r-f (radio-frequency) transformers supplied is used to adapt the input circuits of the antenna coupler for the particular antenna system in use. One of the 16 plug-in interstage filters supplied is selected to pass the band of frequencies over which operation is required with minimum interference from signals outside that band.

4. System Application

The system block diagram (fig. 2) shows the application of Antenna Coupler CU-52/URR. The antenna system transmission line is fed to the input of the antenna coupler. The output signals from the antenna coupler are fed to the antenna connectors on the radio receivers. One to 5 receivers having balanced antenna input circuits or 1 to 10 receivers having unbalanced antenna input circuits can be used. A maximum of nine receivers having balanced and unbalanced antenna input circuits also can be used.

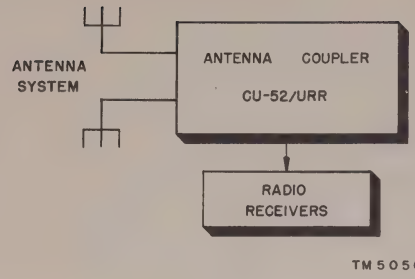


Figure 2. Antenna Coupler CU-52/URR, system block diagram.

5. Technical Characteristics

Frequency range . . . . . .1 mc to 24 mc.
Number of receivers matched:
  Unbalanced input . . . . . 10 max.
  Balanced input . . . . . 5 max.
  Balanced and unbalanced input. . 9 max.
Input impedance:
  Unbalanced . . . . . 50 ohms.
  Balanced . . . . . 100 ohms and 600 ohms.
  Unbalanced or balanced . . Any impedance, using resistor terminations.
Number of tubes . . . . . 19.
Power supply voltage. . . . 115/230 volts, 50-60 cps, single-phase ac.
Power input:
  At 115 volts . . . . . 1.5 amperes.
  At 230 volts . . . . . .75 amperes.
Weight . . . . . 56.5 lb.

6. Packaging Data

a. GENERAL. The operating and spare components of Antenna Coupler CU-52/URR are packed in two wooden crates. One crate contains Antenna Coupler Case CY-1020/URR, in which is placed the antenna coupler. The other crate contains Electrical Standardized Components Case CY-1021/URR, in which are placed the running spares and the balance of the operating components (par. 7).

b. OVERSEA PACKING. When packed for oversea shipment, each carrying case is first placed in a corrugated fiberboard carton; corrugated fiberboard pads are placed around the carrying case. The carton is placed in a waterproof barrier and is sealed. This package then is placed in a nailed wooden crate having a waterproof liner. Steel straps are placed around the crate.

c. DOMESTIC SHIPMENT. When packed for domestic shipment, each case is packed as described in subparagraph b above, except that the waterproof liner is not used.

d. CONTENTS OF CRATES. The following list indicates the contents of each crate. Refer to the packing list attached to each crate for exact contents.

Crate dimensions (in.)	Contents
29-3/4 x 27-1/4 x 13-1/4	Antenna Coupler Case CY-1020/URR containing: Antenna Coupler CU-52/URR
36 x 33 x 15	Electrical Standardized Components Case CY-1021/URR (See par. 7)

7. Table of Components (fig. 3)

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Volume (cu ft)	Unit weight (lb)
Antenna Coupler Case CY-1020/URR:	1	24-17/32	11	22-1/2	4.22	40
Antenna Coupler CU-52/URR:	1	6-31/32	18	19	1.65	56-1/2
Front panel and frame	1	6-31/32	18	19	1.65	8-1/4
Main chassis	1	5-1/32	16-1/4	17-3/16	.974	10-3/5
Input amplifier	1	5-1/2	12-11/16	3-3/8	.163	2-1/10
Output amplifier	5	4-1/4	10-1/4	2-11/16	.081	2-1/10
Power supply	1	5-11/16	6-3/8	13-5/8	.353	29
Electrical Standardized Components Case CY-1021/URR:	1	8-1/32	29-1/2	28-1/4	2.1	58
R-f transformer	8	4	1-15/16	2-3/8	.013	1/4
Interstage filter	16	4	1-15/16	2-3/8	.013	1/4
Connector UG-573/U	11	3/4 (dia)		1-31/64	.024	1/10
Connector UG-421/U	6	27/32 (dia)		2	.037	1/10
Special Purpose Electrical Cable Assembly CX-2095/U	2			36-9/16		1/5
Power Cable Assembly CX-1505/U	1			120		1-1/3
Running Spares (See par. 10)	1 set					1/2

Note. This list is for general reference only. See appropriate supply publications for information pertaining to requisition of spare parts.

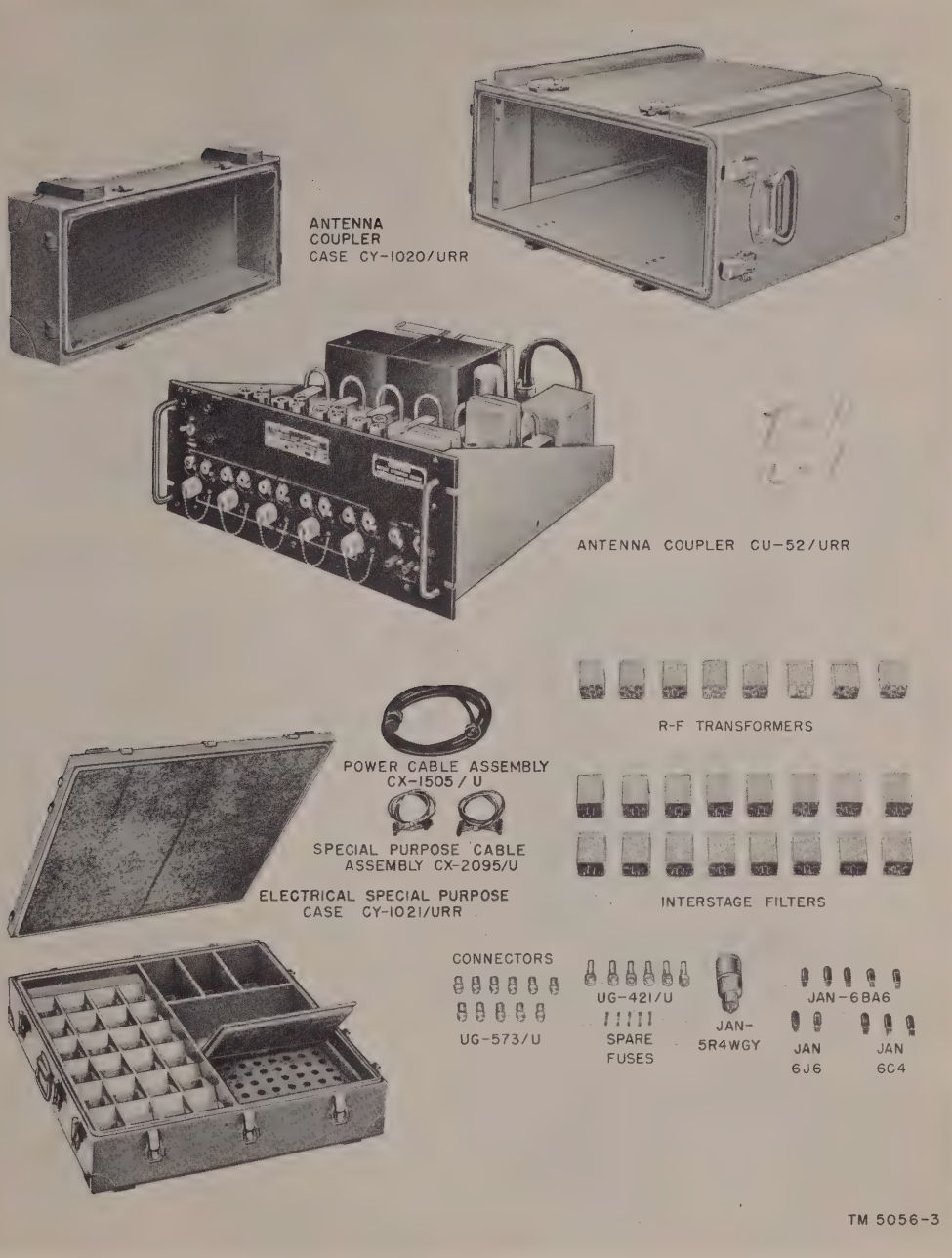


Figure 3. Antenna Coupler CU-52/URR, operating and spare components.

8. Description of Antenna Coupler CU-52/URR

a. GENERAL.

(1) Antenna Coupler CU-52/URR is designed for standard rack mounting. The equipment consists of a front panel and frame and a main chassis upon which are mounted an input amplifier chassis, five output amplifier chassis, and a power supply chassis. The POWER switch, the pilot lamp, and the operating and spare fuses are mounted on the front panel.

(2) The antenna connectors on the input amplifier chassis and the receiver connectors on the five output amplifier chassis normally protrude through holes in the front panel to permit connections to be made at the front of the unit. However, the main chassis can be turned around so that access to the connectors is provided at the rear of the unit (par. 16).

b. INPUT AMPLIFIER CHASSIS (fig. 25).

(1) General. The input amplifier chassis mounts upon the main chassis and is held in place by four captive screws. All connections except those to the antenna system are made through a connector mounted at the bottom and near to the rear of the amplifier which mates with a connector mounted on the main chassis. One r-f connector is provided for an unbalanced (coaxial) antenna transmission line. A pair of binding posts is provided for a balanced (open-wire) antenna transmission line. When shipped from the factory, the binding posts are not wired for use. If an open-wire antenna transmission line is to be used, the necessary wiring can be completed readily (par. 15). Eight r-f transformers are supplied; the one selected for the particular antenna system is plugged into the connector provided on the input amplifier chassis. Sixteen interstage filters are supplied; the one which covers the desired frequency range is plugged into the connector provided on the input amplifier chassis.

(2) R-f transformers. The following table lists the r-f transformers supplied. Selection of the correct transformer for the particular antenna system is described in paragraph 14b.

R-f transformer	Antenna system		Frequency range, mc
	Type input	Impedance, ohms	
Z17	Unbalanced	50	.1 to 3.5
Z18	Unbalanced	50	2.4 to 24.0
Z19	Balanced	100	.1 to 3.5
Z20	Balanced	100	2.4 to 24.0
Z21	Balanced	600	.1 to 3.5
Z22	Balanced	600	2.4 to 24.0
*Z23	Variable	Variable up to 10k	.1 to 24.0
Z24	Unbalanced	10,000 ohms	.1 to 24.0

*Note. See paragraph 14b(3).

(3) Interstage filters. The following table lists the interstage filters supplied. Selection of the correct filter is described in paragraph 14c.

Filter	Bandwidth	Frequency range, mc
Z1	Broad	.1 to 1.6
Z2	Broad	.4 to 6.0
Z3	Broad	1.5 to 24.0
Z4	Very broad	.1 to 24.0
Z5	Medium	.1 to 0.4
Z6	Medium	.4 to 1.6
Z7	Medium	1.6 to 6.4
Z8	Medium	6.0 to 24.0

Filter	Bandwidth	Frequency range, mc
Z9	Narrow	.1 to 0.2
Z10	Narrow	.2 to 0.4
Z11	Narrow	.4 to 0.8
Z12	Narrow	.8 to 1.6
Z13	Narrow	1.6 to 3.2
Z14	Narrow	3.0 to 6.0
Z15	Narrow	6.0 to 12.0
Z16	Narrow	12.0 to 24.0

c. OUTPUT AMPLIFIER CHASSIS (fig. 28). Five output amplifier chassis are mounted on the main chassis (fig. 23) and each is held in place by four captive screws. The five chassis are electrically and mechanically identical. All connections except those to the receivers are made through a connector mounted at the bottom and near to the rear of the output amplifier. Five connectors are mounted on the main chassis, and each mates with the connector on one amplifier chassis. One r-f connector is provided on each amplifier for receivers having balanced antenna input circuits. Two r-f connectors are provided on each amplifier for receivers having unbalanced antenna input circuits. (Only one type of receiver input can be connected to a particular amplifier at any one time; that is, one receiver having balanced input circuits or two receivers having unbalanced input circuits.) When shipped from the factory, the output amplifier connectors are wired for unbalanced receiver input circuits; the wiring is readily changed for use with balanced receiver input systems (par. 15).

d. POWER SUPPLY CHASSIS (fig. 31). The power supply chassis is mounted on the main chassis and is held in place by four captive screws. The unit supplies all operating voltages for the equipment. A voltage change-over switch is mounted on the top of the power supply to adapt the equipment for a primary a-c (alternating-current) power source of either 115 volts or 230 volts. A connector and cable completes the circuits to the power switch, fuse, and pilot lamp which are mounted on the front panel; a second connector and cable completes the output voltage circuits to the amplifier chassis; a third connector is provided on the power supply chassis for plugging in the primary power cable assembly (CX-1505/U).

9. Description of Carrying Cases (fig. 3)

a. Antenna Coupler Case CY-1020/URR is a wooden carrying case designed to contain the Antenna Coupler CU-52/URR. The removable lid is held in place by eight spring catch fasteners. The case is transported by means of two handles.

b. Electrical Standardized Components Case CY-1021/URR is a wooden carrying case designed to contain the r-f transformers, the interstage filters, the patch cords (Special Purpose Electrical Cable Assembly CX-2095/U), the receiver connectors, Power Cable Assembly CX-2095/U, and the running spares (par. 10). The removable lid is held in place by 12 spring catch fasteners. The case is transported by means of two handles.

10. Running Spares

A group of running spares is supplied with each Antenna Coupler CU-52/URR and is stored in Electrical Standardized Components Case CY-1021/URR. Following is a list of running spares:

1 tube type 5R4WGY.
5 tubes type 6BA6.
3 tubes type 6C4.
2 tubes type 6J6.
5 fuses, 2-ampere, slow-blow, type 3AG.

11. Additional Equipment Required

The r-f cables listed in the chart below are not supplied as part of the equipment but are required for connecting the antenna coupler to the receivers with the r-f connectors supplied. One additional connector of each type is supplied for terminating the particular antenna transmission line used in the installation. Procedure for assembling each type of connector on the r-f cable is described in paragraph 19.

Cable type	Function	Used with
Radio Frequency Cable RG-8/U	Receivers with unbalanced input.	Connector UG-573/U
Radio Frequency Cable RG-22/U	Receivers with balanced input.	Connector UG-421/U

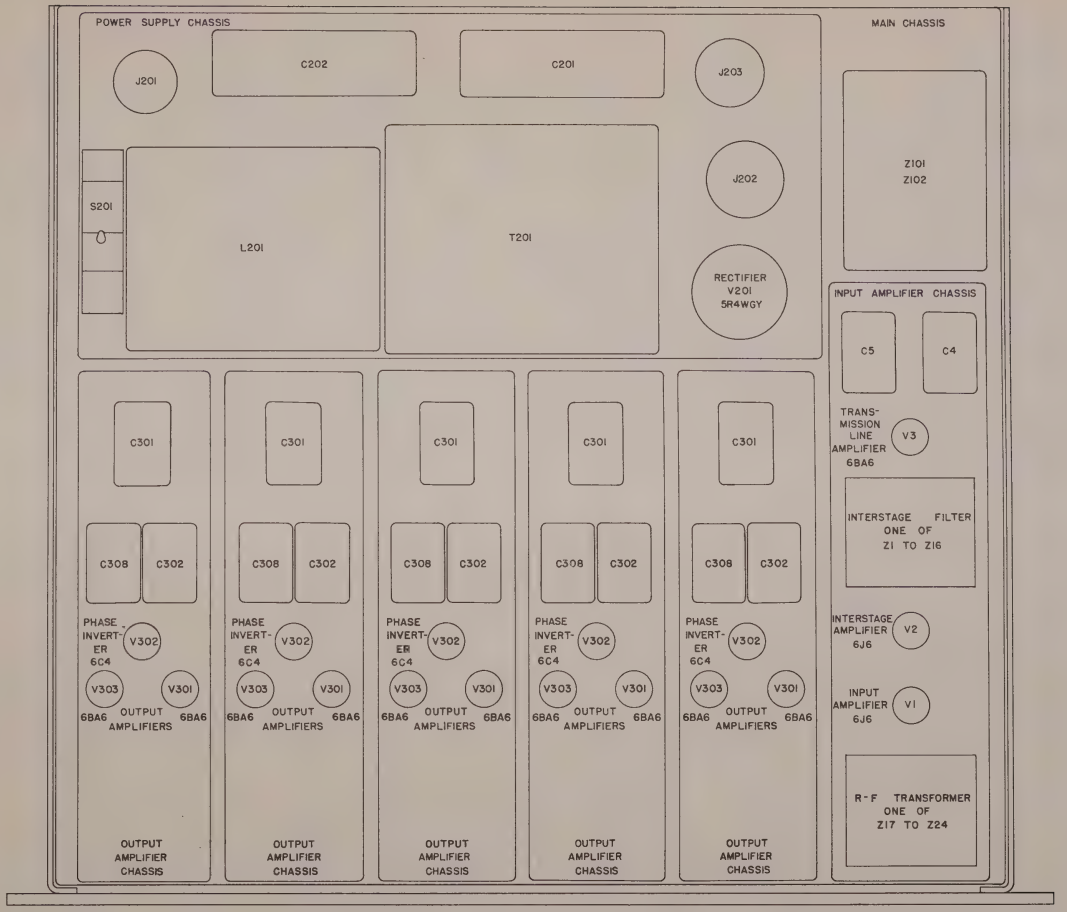


Figure 4. Antenna Coupler CU-52/URR, chassis layout.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

12. Siting

Install Antenna Coupler CU-52/URR near the receivers with which it is to be used. Normally it is placed in the operating shelter with the receivers. The unit is designed for mounting in a standard rack; it can, however, be placed upon a bench or table, if desired. Provisions must be made for entrance of the antenna transmission line into the shelter. A source supplying 115 volts or 230 volts, 50 to 60 cycles ac is required to provide operating power.

13. Uncrating, Unpacking, and Checking

Note. For used or reconditioned equipment, refer to paragraph 21.

a. GENERAL. Equipment may be shipped in oversea packing cases or in domestic packing cases (par. 6). When new equipment is received, select a location where the equipment may be unpacked without exposure to the elements and which is close to the point of installation.

Caution: Be careful in uncrating, unpacking, and handling the equipment; it is damaged easily. If it becomes damaged or exposed, a complete overhaul might be required, or the equipment may be rendered useless.

b. STEP-BY-STEP INSTRUCTIONS FOR UNCRATING AND UNPACKING EXPORT SHIPMENTS. When unpacking either crate, proceed as follows:

(1) Cut the steel straps and remove the nails from the cover of the crate with a nail puller. Remove the cover.
(2) Remove the package from the box.
(3) Cut open the sealed waterproof barrier.
(4) Cut the seals of the corrugated carton.
(5) Remove the corrugated pack around the carrying case.
(6) Remove the carrying case from the carton.

c. CHECKING. Check the contents against the master packing slip.

d. UNPACKING DOMESTIC PACKING CASES. The units may be received in domestic packing cases. The instructions given in subparagraph b above also apply to unpacking domestic shipments. Remove the outer carton and wrappings carefully; then take out the components. Check the contents of the packing case against the master packing slip.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

14. Installation of Components

a. TUBES. Figure 4 shows the location of each tube. The antenna coupler is shipped complete with all tubes in their sockets. Check to see that each of the tubes in the equipment is seated firmly in its socket.

b. R-F TRANSFORMERS.

(1) When shipped from the factory, no r-f transformer is installed in the input amplifier chassis. To install one of the transformers, plug the desired transformer into socket J3. Place the spring-loaded retaining strap over the transformer.

(2) Each r-f transformer is labeled with the reference symbol designation, impedance, and frequency range. (For a discussion of antenna transmission lines, see chapter 4.) The impedance of the antenna transmission line and the desired frequency operating range must be determined. When these factors have been determined, select the correct r-f transformer from the following table:

Antenna type	Transmission line		Frequency range, mc	R-f transformer	Antenna connector
	Impedance, ohms	Type			
1/4-wave Grounded or 1/2-wave Dipole	50	Unbalanced	.1 to 3.5	Z17	J1
	50	Unbalanced	2.4 to 24	Z18	J1
	100	Balanced	.1 to 3.5	Z19	J2 or E1 and E2
	100	Balanced	2.4 to 24	Z20	J2 or E1 and E2
Rhombic or 3-wire Dipole	600	Balanced	.1 to 3.5	Z21	J2 or E1 and E2
	600	Balanced	2.4 to 24	Z22	J2 or E1 and E2
Any (See subpar. (3).)	Any	Balanced or unbalanced	.1 to 24	Z23	Any
Monopole	High	Unbalanced	.1 to 24	Z24	J1

*Note. See following subparagraph (3).

(3) When none of the r-f transformers having a specific application is suitable for a particular antenna system, use r-f transformer Z23. This unit contains a blank terminal board mounted on the connector base within the can. Five terminals are provided on the board for connecting resistors which are to be selected in accordance with the particular application (fig. 5). The unit can be used for either a balanced or an unbalanced antenna transmission line. One resistor is used for an unbalanced line having a value equal to the impedance of the line. Two resistors are used for a balanced line, each resistor having a value equal to one-half the impedance of the line. Connect the resistor and the jumper as shown in the left section of figure 5 when the unit is to be used for an unbalanced line. Connect the two resistors and the jumper as shown in the right section of figure 5 when the unit is to be used with a balanced line. To gain access to the terminal board, remove the four screws holding the can to the base and remove the can. After making the necessary connections, replace the can and the screws.

c. INTERSTAGE FILTERS.

(1) When shipped from the factory, no interstage filter is installed in the input amplifier chassis. Procedure for installing the filters is the same as described for the r-f transformers.

(2) Each filter is labeled with its reference symbol designation, bandwidth, and frequency coverage. For optimum freedom from interfering signals, select the filter having the narrowest bandwidth within the desired frequency range. For example, if the receivers are to be used only for signals in the range of .1 mc to .2 mc, install filter Z9. The characteristics of each filter are tabulated in subparagraph 8b(3).

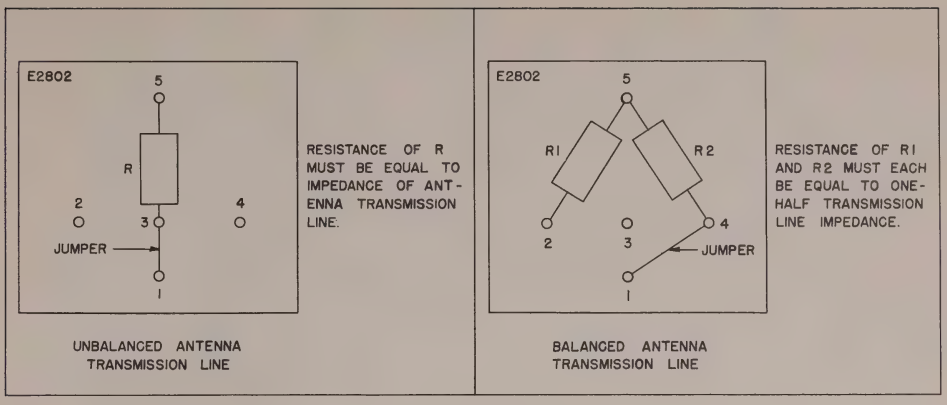


Figure 5. R-f transformer Z23, terminal board connections.

15. Internal Connections

a. NORMAL CONNECTIONS. When shipped from the factory, the internal connections are as described in the following subparagraphs. Certain alternate connections are provided for in the antenna input and the receiver output circuits to permit connecting the antenna coupler to various types of antennas and receivers. Provision also is made for changing the connections of the power transformer for either 115-volt or 230-volt a-c input.

(1) Antenna circuits.

(a) The unbalanced antenna connector J1 (UNBAL) is wired to receptacle J3 and is used with an unbalanced transmission line. The connections to J1 do not require changing for particular antenna systems since its circuit is completed to the input amplifier V1 only when the correct r-f transformer is installed. It is out of circuit when one of the balanced input transformers is installed.

(b) Balanced antenna connector J2 (BAL) is wired to receptacle J3 and is used with a balanced (shielded) transmission line. When a balanced (open-wire) transmission line is used, J3 must be disconnected and binding posts E1 and E2 wired to receptacle J3, as described in subparagraph b below.

(2) Receiver circuits. The output circuits of each output amplifier chassis are wired for receivers having unbalanced receiver systems. Connectors J302 and J304 are in the circuit for this application. When a balanced output is required from an output amplifier chassis, connectors J302 and J304 must be disconnected and connector J303 wired into the circuit, as described in subparagraph b below.

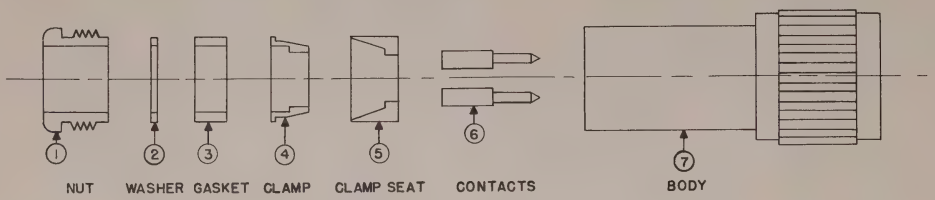
(3) Power input. The power transformer is adaptable to either 115 volts or 230-volts a-c input. Change-over switch S201 is provided for making the required change. When shipped from the factory, switch S201 is set for 115-volt input. Procedure for adapting the equipment to 230-volt input is described in subparagraph b below.

b. ALTERNATE CONNECTIONS. Procedure for changing the alternate circuits for the particular installation are described below.

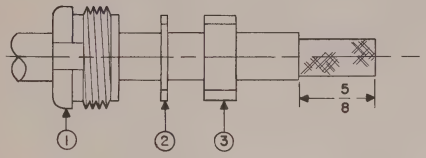
(1) Antenna circuits. To connect binding posts E1 and E2 (BAL) for use with a balanced (open-wire) transmission line, proceed as follows:

(a) Loosen the four captive screws on the input amplifier chassis.

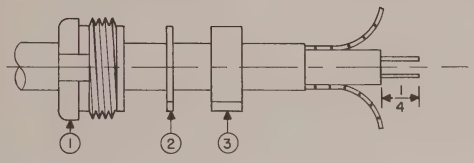
(b) Using the handle at the rear of the



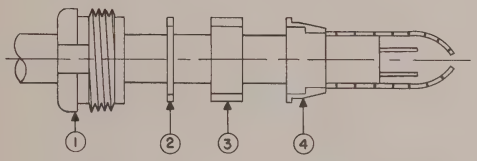
IDENTIFICATION OF CONNECTOR PARTS, AND ASSEMBLY SEQUENCE



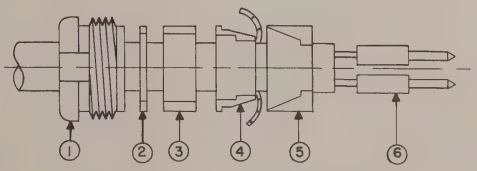
1. PLACE NUT, WASHER AND GASKET OVER CABLE. CUT OFF JACKET FOR DISTANCE OF 5/8 INCH FROM END OF CABLE. DO NOT NICK BRAID.



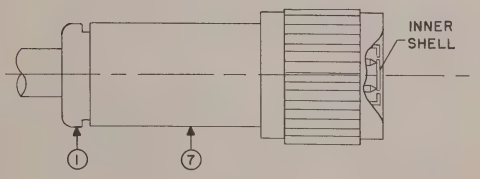
2. COMB BRAID WIRES AND FOLD OUT. CUT OFF DIELECTRIC FOR DISTANCE OF 1/4 INCH. DO NOT NICK CONDUCTORS.



3. PULL BRAID WIRES FORWARD AND TAPER OVER CENTER CONDUCTORS. PLACE CLAMP OVER BRAID. PUSH CLAMP BACK AGAINST CABLE JACKET.



4. FOLD BACK BRAID. TRIM TO PROPER LENGTH, AND FORM OVER CLAMP. PLACE CLAMP SEAT OVER DIELECTRIC AND PUSH AGAINST CLAMP. SOLDER CONTACTS TO CONDUCTORS.



5. INSERT CABLE AND PARTS INTO CONNECTOR BODY. CONTACTS MUST BE FLUSH WITH INNER SHELL. TIGHTEN NUT SECURELY WITH WRENCH.

TM 5056-6

Figure 6. Balanced cable fabrication diagram.

chassis, pull the chassis upward until the connectors are disengaged. Use a straight upward pull to avoid damage to the connectors.

(c) Lift the chassis up and back until the r-f connectors are clear of the front panel holes. To avoid damage to the connector on the bottom of the chassis, be careful when placing the chassis on the bench.

(d) Remove the bottom cover plate.

(e) Unsolder both wires on the terminals of connector J2. Do not unsolder the other ends of the wires at connector J3.

(f) Solder the wire from pin 1 of J3 to binding post E1 and from pin 5 of J3 to binding post E2.

(g) Replace the bottom cover plate.

(h) Replace the input amplifier on the main chassis and tighten the mounting screws.

(2) Receiver circuits. To wire connector J303 of any of the five output amplifier chassis for use with a balanced receiver system, proceed as follows:

(a) Unscrew the cap from connector J303 on the particular output amplifier chassis.

(b) Remove the output amplifier chassis from the main chassis as described for the input amplifier chassis.

(c) Remove the bottom cover plate.

(d) On the under side of the chassis are two terminal boards, E304 and E306, adjacent to the r-f connectors. On each board is a jumper of insulated wire which connects together the two terminals immediately above C306 on one board and C303 on the other board (figs. 29 and 30). Unsolder one end of each jumper, at the terminal nearest to the r-f connectors.

(e) Solder the free end of one jumper to the nearer terminal on connector J303. Solder the free end of the other jumper to the remaining terminal on connector J303.

(f) Replace the bottom cover plate.

(g) Replace the output amplifier on the main chassis and tighten the mounting screws.

(h) Proceed in the same manner for each of the remaining four output amplifier chassis, if required.

(3) Power input. Proceed as follows to adapt the equipment for operation on a 230-volt a-c source:

(a) Remove the screw which holds in place the bracket on switch S201. Remove the bracket and replace the screw.

(b) Set switch S201 to the 230-volt position.

(c) Remove the screw on the opposite side of the switch.

(d) Place the bracket in position over the screw hole and replace the screw.

16. Reversal of Main Chassis

To obtain access to the r-f connectors at the rear of the equipment, reverse the main chassis as follows:

a. Remove the cap and chain from all front panel connectors.

b. Remove the three connectors from the power supply chassis.

c. Remove the six screws that hold the main chassis to the frame.

d. Slide the main chassis out of the frame and turn it around so that the r-f connectors are at the rear.

e. Slide the main chassis back into the frame and replace the mounting screws.

f. Reconnect the cable connectors to the power supply chassis.

g. Replace the caps on the r-f connectors and fasten the chains.

17. Cabling
(fig. 22)

Two cables are used to interconnect the various units in Antenna Coupler CU-52/URR. A third cable is used to make connections to the primary power source. All other connections between units are made automatically, as the units are installed on the main chassis, through the connectors mounted on each amplifier chassis and the main chassis. Connections to the antenna system and the associated receivers are described in paragraph 20.

a. PANEL CABLE. Aline the slot in connector P401 on the panel cable W401 with the key in connector J201 on the power supply chassis and press P401 into J201; be careful to avoid damage to the pins. Turn the collar on P401 clockwise until tight; then press P401

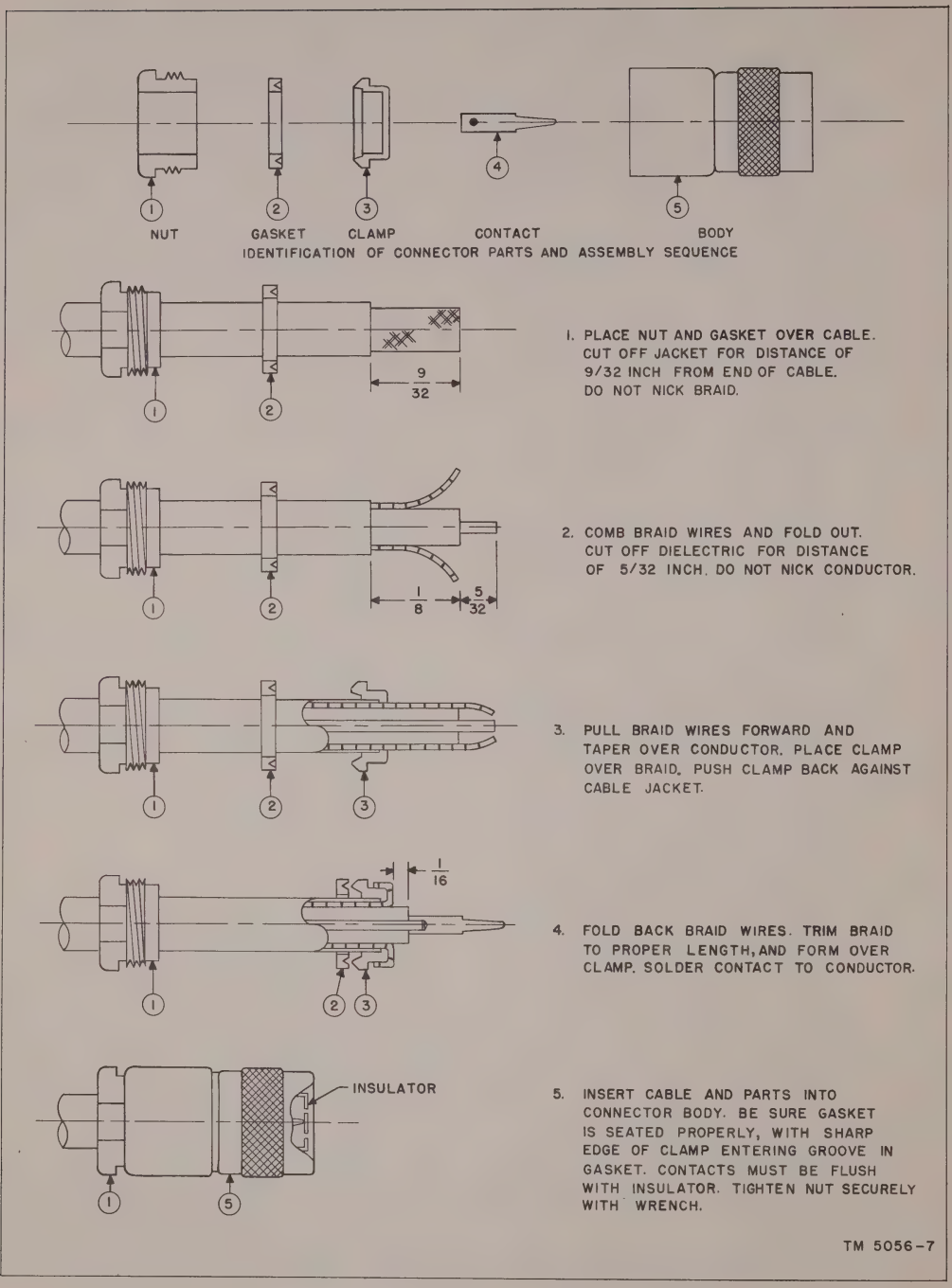

1
NUT
2
GASKET
3
CLAMP
4
CONTACT
5
BODY
IDENTIFICATION OF CONNECTOR PARTS AND ASSEMBLY SEQUENCE
9/32
1. PLACE NUT AND GASKET OVER CABLE. CUT OFF JACKET FOR DISTANCE OF 9/32 INCH FROM END OF CABLE. DO NOT NICK BRAID.
1/8
5/32
2. COMB BRAID WIRES AND FOLD OUT. CUT OFF DIELECTRIC FOR DISTANCE OF 5/32 INCH. DO NOT NICK CONDUCTOR.
3. PULL BRAID WIRES FORWARD AND TAPER OVER CONDUCTOR. PLACE CLAMP OVER BRAID. PUSH CLAMP BACK AGAINST CABLE JACKET.
1/16
4. FOLD BACK BRAID WIRES. TRIM BRAID TO PROPER LENGTH, AND FORM OVER CLAMP. SOLDER CONTACT TO CONDUCTOR.
INSULATOR
5. INSERT CABLE AND PARTS INTO CONNECTOR BODY. BE SURE GASKET IS SEATED PROPERLY, WITH SHARP EDGE OF CLAMP ENTERING GROOVE IN GASKET. CONTACTS MUST BE FLUSH WITH INSULATOR. TIGHTEN NUT SECURELY WITH WRENCH.
TM 5056-7

Figure 7. Unbalanced cable fabrication diagram.

again. Continue until alternate pressing on the connector and turning of the collar causes no further entrance of P401 into J201. Tighten the collar firmly.

b. OUTPUT POWER CABLE. The output power cable (W401) extends from the noise filter can on the main chassis. Through this cable are completed all voltage circuits to the six amplifier chassis. Plug connector P101 on the cable into connector J203 on the power supply chassis. Use the same procedure as described in subparagraph a above.

c. PRIMARY CABLE. The primary cable (W501), which completes the circuit to the power source, is packed in Electrical Standardized Components Case CY-1021/URR. Unpack the cable. Plug connector P502 into receptacle J202 on the power supply chassis. Plug connector P501 into the convenience receptacle after the equipment has been mounted.

18. Mounting

The antenna coupler is designed to mount in a standard rack; it is secured by four panel screws. Generally, two persons are required to mount it in the rack. Hold the unit in place so that the four slots in the front panel line up with the mounting holes on the rack. Insert the mounting screws and tighten them securely.

19. Cable Fabrication
(figs. 6 and 7)

a. GENERAL. R-f connectors are supplied with the equipment for assembling the cables required to connect the antenna system to the antenna coupler and to connect the antenna coupler to the receivers. Eleven Connectors UG-573/U are supplied for unbalanced antenna transmission lines and receiver systems. Six Connectors UG-421/U are supplied for balanced antenna transmission lines and receiver systems. Determine how many cables of either type are required for the particular installation. Proceed as described in subparagraphs b and c below.

b. BALANCED CABLES. Fabrication of the balanced cables is identical for use with either balanced antenna systems or balanced receiver input circuits. One Connector UG-421/U and one Radio Frequency Cable RG-22/U are required for each balanced cable assembly. Cut the cable to the desired length and terminate one end with the connector as shown in figure 6. The termination at the other end of the cable will depend on the particular antenna system and receiver type.

c. UNBALANCED CABLES. Fabrication of the unbalanced cables is identical for use either with unbalanced antenna systems or unbalanced receiver input circuits. One Connector UG-573/U and one Radio Frequency Cable RG-8/U are required for each cable assembly. Cut the cable to the required length, and terminate one end with the connector as shown in figure 7. The termination at the other end of the cable will depend on the particular antenna system and receiver type.

d. OPEN-WIRE LINE. No particular instructions are required for terminating an open-wire transmission line. The wires at the end of the line should be tinned to prevent fraying.

20. External Connections
(fig. 8)

When all necessary internal wiring changes and cable fabrication have been completed, the antenna coupler is ready for connection to the antenna system and the receivers.

a. ANTENNA CONNECTIONS. Before making connections to the antenna system, be sure that the input circuits on the input amplifier chassis have been altered, if necessary, for use with the particular antenna system. Make connections as follows:

(1) Unbalanced input. If an unbalanced (coaxial) antenna transmission line is used, aline the slot opening on the transmission line connector with the projection on the front panel connector labeled UNBAL. INPUT (No. 2). Press the transmission line connector firmly on the front panel connector; at the same time, turn the transmission line connector clockwise until it is tight.

(2) Balanced Input.

(a) If a balanced (shielded) antenna transmission line is used, line up the slot on the transmission line connector with the projection on the front panel connector labeled BAL. INPUT (No. 1). Press the transmission line connector pins into the front panel receptacle; turn the collar clockwise until tight.

(b) If an open-wire balanced antenna transmission line is used, connect one wire to one of the front panel binding posts labeled BAL. Connect the other wire to the remaining binding post. Tighten both binding posts securely.

b. RECEIVER CONNECTIONS. Before making connections to the receivers, be sure that the output circuits on each output amplifier chassis have been altered, if necessary, for use with the particular receivers. Make connections as follows:

(1) Unbalanced receivers. If unbalanced receiver types are used, connect each r-f connector on the receiver cables to one of the front panel connectors labeled UNBALANCED OUTPUT (Nos. 1 through 10).

(2) Balanced receivers. If balanced receiver types are used, connect each r-f connector on the receiver cables to one of the front panel connectors labeled BALANCED OUTPUT (Nos. 1 through 5).

Note. Only one type of receiver can be connected to a particular output amplifier chassis at one time. Thus, if an output amplifier chassis has been altered for a balanced type receiver, that chassis cannot be used with an unbalanced type receiver.

c. POWER CONNECTIONS. When all connections described have been completed, plug connector P501 on the power cord into the convenience receptacle.

Caution: Be sure that change-over switch S201 is set in the correct position for the line voltage used.

21. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions given in paragraph 13 for uncrating, unpacking, and checking the equipment.

b. Check the used or reconditioned unit for tags or other indications pertaining to changes in wiring. If any wiring changes have been made, note the change in this manual, preferably on the schematic diagram.

c. Perform the installation and connection procedures given in paragraphs 14 through 20.

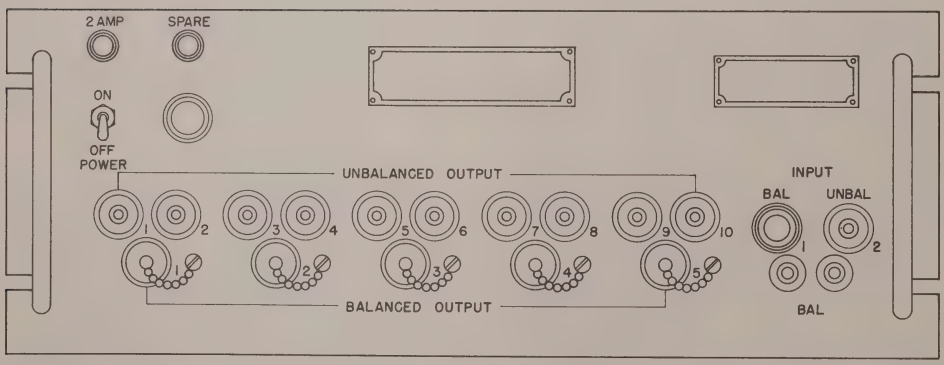


Figure 8. Antenna Coupler CU-52/URR, front panel.

Section II. CONTROLS

22. Power Switch

The POWER switch, S401, is mounted on the front panel. The purpose of switch S401 is to turn the unit on and off.

23. Voltage Change-over Switch

Change-over switch S201 is mounted on the power supply chassis. The purpose of S201 is to change the connections of the primary windings of power transformer T201 for 115-volt or 230-volt operation. A retaining bracket holds S201 in the set position to prevent accidental changing of the switch setting.

Section III. OPERATION UNDER USUAL CONDITIONS

24. Preliminary Procedure

Before operating the equipment, be sure that change-over switch S201 is set in the correct position for the power line voltage used at the installation site. Check to see that all tubes are seated firmly in their sockets. A 2-ampere fuse must be in the fuseholder on the front panel. Check to see that the interunit connectors and the external connectors are in place and are fastened firmly. If the BALANCED OUTPUT front panel connectors are not in use see that the cap on each connector is fastened tightly in place. Be sure that the correct r-f transformer is installed for the particular antenna transmission line and frequency range. Install the interstage filter with the narrowest bandwidth within the required operating frequency range.

25. Starting and Stopping Procedure

To start the equipment, throw the POWER switch to the ON position. To stop the equipment, throw the POWER switch to the OFF position.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

26. General

The operation of Antenna Coupler CU-52/URR may be difficult where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs instructions are given on procedures for minimizing the effect of these unusual operating conditions.

27. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow.

a. Handle the equipment carefully.

b. Keep the equipment warm and dry. If the set is not in a heated inclosure, construct an insulated box for the set.

c. Locate the equipment inside a heated inclosure where there is no danger of a cold draft striking the glass tubes when a door is opened. A sudden draft of cold air is often sufficient to shatter the glass envelope of a heated tube. If the inclosure is so constructed that this precaution is impossible, place a blanket or some barrier between the source of the draft and the equipment.

d. When equipment which has been exposed to the cold is brought into a warm room, it will start to sweat and will continue to do so until it reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. This condition also arises when equipment warms up during the day after exposure during a cold night.

28. Operation in Tropical Climates

When operated in tropical climates, radio equipment may be installed in tents, huts, or, when necessary, in underground dugouts. When equipment is installed below ground and when it is set up in swampy areas, moisture conditions are more acute than normal in the tropics. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the ambient air. To minimize this condition, place lighted electric bulbs under the equipment.

29. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measures to insure proper operation of the equipment.

b. The main problem which arises with equipment operation in desert areas is the large amount of sand or dust and dirt which enters the parts of radio equipment. The ideal preventive precaution is to house the equipment in a dustproof shelter. Since, however, such a building is seldom available and would require air conditioning, the next best precaution is to make the building in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors, cover the inside walls with heavy paper, and secure the side walls of tents with sand to prevent their flapping in the wind.

c. Never tie power cords, signal cords, or other wiring connections to either the inside or the outside of tents. Desert areas are subject to sudden wind squalls which may jerk the connections loose or break the lines.

d. Take care to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks (pars. 32 through 35).

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

30. Tools and Materials Supplied

No tools or materials are supplied with Antenna Coupler CU-52/URR for performing the operations described in this chapter.

31. Tools and Materials Required

The following tools and materials are required for organizational maintenance procedures.

a. TOOLS,
Tool Equipment TE-41.
b. MATERIALS.
#0000 sandpaper.
Cheesecloth.
Solvent, dry-cleaning (SD).

Section II. PREVENTIVE MAINTENANCE SERVICES

32. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that break-downs and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. See AR 750-5.

33. General Preventive Maintenance Techniques

a. Use #0000 sandpaper to remove corrosion.
b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.
(1) If necessary, except for electrical contacts, moisten the cloth or brush with solvent (SD); then wipe the parts dry with a cloth.
(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

c. If available, dry compressed air may be used at a line pressure not exceeding 30 pounds per square inch to remove dust from inaccessible places; be careful however, or mechanical damage from the air blast may result.
d. For further information on preventive maintenance techniques, refer to TB SIG 178.

34. Use of Preventive Maintenance Forms (figs. 9 and 10)

a. The information in paragraph 35 is presented as a guide to the individual making an inspection of equipment in accordance with instructions on DA AGO Forms 11-238 and 11-239. The decision as to which items on the forms are applicable to this equipment is a tactical decision to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE | EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	W	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).*							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION.							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS.							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION.							
6	CHECK FOR NORMAL OPERATION.							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND RACKS, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS.		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN.		15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER-PROOFING.	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

SAMPLE

DA AGO FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TMCL-238

Figure 9. DA AGO Form 11-238, sample form.

b. The first two columns in the table in paragraph 35 serve as a cross reference between the item numbers of DA AGO Forms 11-238 and 11-239 and the preventive maintenance information in this manual.

35. Performing Preventive Maintenance

The following preventive maintenance operations should be performed at the intervals indicated, unless these intervals are reduced by the local commander.

Caution: Screws, bolts, and nuts should not be tightened carelessly. Connectors should be made fingertight only. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

DA AGO Form 11-238 item No.	DA AGO Form 11-239 item No.	Procedures
		DAILY
1	1	Check for completeness and satisfactory condition of the antenna coupler. The components of the equipment are listed in paragraph 7 and illustrated in figure 3.
2	2	Check suitability of location and installation for normal operation.
3	3	Clean dirt and moisture from antenna and receiver connectors and the front panel.
4	4	Inspect the seating of the fuse on the front panel and all connectors.
5	5	Inspect the POWER switch for proper operation.
6	6	Check the equipment for normal operation.
		WEEKLY
		Caution: Disconnect the power cord from the convenience receptacle before performing the following operations. Upon completion, reconnect the power cord and check for satisfactory operation.
7	7	Clean and tighten the mounting panel.
8	8	Inspect the frame, chassis, and exposed metal surfaces for rust, corrosion, and moisture.
9	9	Inspect the interunit cables, the power cable, the antenna transmission line, and the receiver input cables for cuts, breaks, fraying, deterioration, kinks, and strain.
10	10	Inspect the antenna installation for eccentricities, corrosion, and damaged insulators.
12	12	Inspect for looseness of the POWER switch, antenna input connector, receiver connectors, fuseholder, pilot lamp assembly, and tubes.
14	14	Clean the nameplate, caution plate, and pilot lamp jewel.
16	16	Inspect the operating shelter for adequacy of weatherproofing.
		MONTHLY
	19	Check the rectifier V201 for loose envelope; check the other tubes for cracks; check for insufficient socket spring tension; check emission of all tubes.
		Caution: After checking, replace each tube in the same socket from which it was removed (fig. 4).
	21	Inspect fixed capacitors for leaks, bulges, and discoloration.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ⓧ Defect corrected.
NOTE: Strike out items not applicable.

NO	ITEM	CONDITION	NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (*receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories*).		19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS; INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES.	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION.		20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS.		21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION.	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.		22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION.		23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT PLATES, AND LOOSE MOUNTINGS.	
6	CHECK FOR NORMAL OPERATION.		24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE.	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES; SHOCK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS; [illegible] TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTORS.		25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.		26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE.	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN.		27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.		28	CHECK SETTINGS OF ADJUSTABLE RELAYS.	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.		30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.		31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS.	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.		32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE.	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.		33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING.		34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.		35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.		36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS.	
			37	MOISTURE AND FUNGIPROOF.	
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.				

SAMPLE

DA AGO FORM 1 MAY 51 11-239 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE. 48-10-44583-1

TMCL-239

Figure 10. DA AGO Form 11-239, sample form.

DA AGO Form 11-238 item No.	DA AGO Form 11-239 item No.	Procedures
		MONTHLY
	24	Inspect resistors for cracks, chipping, blistering, discoloration, and moisture.
	25	Inspect terminals of large fixed capacitors and resistors for corrosion, dirt, and loose contacts.
	26	Clean and tighten switches, terminal boards, and interior of chassis.
	27	Inspect terminal boards for loose connections, cracks, and breaks.
	31	Clean and tighten connections and mountings for the power transformer and the reactor.
	32	Inspect the power transformer and the reactor for overheating and leakage.
	37	Check adequacy of moisture-proof and fungiproof treatment.
	38	If deficiencies noted are not corrected during inspection, indicate what action was taken to correct the deficiencies.

Section III. LUBRICATION AND WEATHERPROOFING

36. Lubrication

No lubrication is required for Antenna Coupler CU-52/URR.

37. Weatherproofing

a. GENERAL. Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. TROPICAL MAINTENANCE. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 72.

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are fully explained in TB SIG 66 and TB SIG 219.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

38. Rustproofing and Painting

a. When the finish on the panel has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use #00 and #000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

Section IV. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

39. Scope

a. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued and by the existing tactical situation. Accordingly, the trouble shooting described in this section is based on the performance of the equipment and the use of the senses in determining such troubles as burned-out tubes, etc.

b. The paragraphs which follow in this section help in determining which of the units, such as the power supply chassis or one of the amplifier chassis, are at fault. Localizing the fault in that unit to the defective stage or item is described in chapter 5.

40. Visual Inspection

a. Failure of this equipment to operate normally will usually be caused by one or more of the following faults:

(1) Worn, broken, or disconnected cables or connectors.
(2) Burned-out fuse. (Generally, this is an indication of some other fault.)
(3) Wires broken because of excessive vibration. (This is not usual in a fixed installation.)
(4) Defective tubes or other items.
(5) Defective antenna system.
(6) Incorrect r-f transformer for the particular antenna system and frequency range.
(7) Incorrect interstage filter for the frequency range to be covered.
(8) Defective receivers.

b. When failure is encountered and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred.

c. Visually inspect the antenna system for obvious abnormalities.

d. Check the operation of the receivers by disconnecting them from the antenna coupler and connecting each directly to the antenna system. If a particular output amplifier chassis is suspected, disconnect the receivers from that chassis and connect them to one of the other output amplifier chassis.

e. Visually inspect each tube while the equipment is operating to check for burned-out filaments.

f. Check the cables and connectors which complete the circuits from the antenna system to the antenna coupler and from the antenna coupler to the receivers.

41. Trouble Shooting by Using Equipment Performance Checklist

a. GENERAL. The equipment performance checklist (par. 42) will help the operator to locate trouble in the equipment. The list gives the item to be checked, the conditions under which the item is checked, the normal indications of correct operation, and the corrective measures the operator can take.

b. ACTION OR CONDITION. For some items, the information given in the action or condition column consists of a switch setting under which the item is to be checked. It represents an action that must be taken to check the normal indication given in the normal indications column.

c. NORMAL INDICATIONS. The normal indications listed include the visible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. CORRECTIVE MEASURES. The corrective measures listed are those the operator can make without turning in the equipment for repairs. The table in paragraph 67 indicates whether the trouble can be corrected during operation or whether trouble shooting by an experienced repairman is necessary. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

42. Equipment Performance Checklist

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Antenna	Transmission line connected to coupler.		
	2	Receiver	Receiver cables connected to proper output connectors.		
OPERATION	3	POWER switch	Turn to ON position.	Pilot lamp lights. All receivers operate.	Check lamp, switch, and fuse. Refer to paragraph 67.
STOP	4	POWER switch	Turn to OFF position.	Pilot lamp goes out.	Check switch.

CHAPTER 4

THEORY

43. Function of Equipment

a. When several receivers are to be used simultaneously at the same location, it generally is not feasible to provide a separate antenna for each receiver because of lack of space and other practical limitations. Usually it is desirable to erect a single, highly efficient antenna system for use with the receiver installation. However, the use of a single antenna system connected directly to several receivers is undesirable. Among the objections to such practice are the following:

(1) Connecting several receiver input circuits in parallel causes mutual interference because of the radiation from the local oscillators.

(2) Correct matching of each receiver input circuit to the antenna system is difficult; it prevents optimum transfer of received energy. This factor is particularly serious when several of the receivers have balanced input circuits and the others have unbalanced input circuits (par. 45).

b. The use of Antenna Coupler CU-52/URR between the antenna system and the receivers eliminates the objections described in subparagraph a above for the following reasons:

(1) The use of the correct r-f transformer in the equipment permits optimum energy transfer from the antenna system to the input amplifier circuits of the antenna coupler.

(2) Independent output circuits for each receiver serve to isolate the receivers from each other, so that there is a minimum of interaction.

(3) Alternate output connections for each receiver permit each receiver input circuit to be matched correctly for optimum efficiency.

(4) The use of interstage filters provides maximum freedom from interference.

(5) The over-all system provides efficient signal transfer from the antenna system to the receivers over the operating frequency range.

44. Antenna Systems

a. GENERAL. The antenna is used to intercept energy from the sending station. Various types of antenna are used in military installations (par. 14). To make use of the received energy, a lead-in (transmission line) is used to transfer the signal from the antenna to the receiving equipment.

b. INPUT IMPEDANCE. An important factor in the practical application of an antenna is the input impedance. The input impedance at the point of connection (feed point) of the antenna is the r-f voltage at that point divided by the r-f current at that point. The input impedance is important because the impedance of the transmission line must match the antenna input impedance for maximum transfer of energy. At the receiver, the input circuit impedance must be matched to the impedance of the transmission line for minimum loss in energy.

45. Transmission Lines

Transmission lines between antennas and receivers can be of several different types. The type used depends on the particular antenna. Antenna Coupler CU-52/URR can be connected to any type of transmission line through the use of the correct r-f transformer and the use of the alternate input connections provided (par. 15b).

a. BALANCED LINE.

(1) A balanced line consists of two wires symmetrically arranged. Because of the symmetrical arrangement, the

impedance to ground of each side of the line is approximately equal. For minimum attenuation of the received signal. a balanced line should be used between an antenna system which is balanced to ground and a receiver input circuit which is balanced to ground.

(2) A shielded balanced line consists of two parallel wires suitably insulated and encased in a metallic shield with an over-all insulating jacket. Radio Frequency Cable RG-22/U is one type of shielded balanced line. The shielding prevents the transmission line from intercepting unwanted signals or noise.

(3) The unshielded open-wire balanced line consists of two parallel wires suitably insulated from each other. It is similar in operation to the shielded line; however, it is more susceptible to noise and other interference and should not be used when the shielded line is available.

b. UNBALANCED LINE.

(1) The coaxial cable is an unbalanced transmission line. This cable consists of a center conductor concentrically arranged within a metallic shield with a suitable insulating medium to maintain the relative positions of the conductor and the shield. An additional insulating jacket is provided over the shield. Radio Frequency Cable RG-8/U is one type of unbalanced line.

(2) Because of the asymmetrical construction of a coaxial line, the two sides of the circuit on such a line have entirely different impedances to ground. Currents tend to flow on the outer surface of the coaxial line. The unbalanced line is used between antenna systems and receiver input circuits which are unbalanced to ground.

46. Cross Modulation

a. Antenna Coupler CU-52/URR is essentially an untuned r-f amplifier and, therefore, is susceptible to certain types of interference. If no precautions are taken, undesired signals will be amplified in the unit and passed on to the receivers. These unwanted signals tend to modulate the desired signal. Such interference, detectable as a superimposed modulation on the desired signal, is known as cross modulation. When cross modulation is present, the unwanted signal often can be tuned in at several points on the receiver dial.

b. To reduce the effects of cross modulation, interstage filters are provided with the antenna coupler. Each filter is designed to pass a particular band of frequencies. Signals outside of that frequency range will be rejected by the filter and will not pass into the receivers. For optimum freedom from cross-modulation effects, the filter having the narrowest bandwidth, within the desired frequency range, should be used.

47. Block Diagram (fig. 11)

Antenna Coupler CU-52/URR is a broadband coupling device designed to allow operation from a single antenna of 1 to 10 radio receivers with unbalanced input circuits, or 1 to 5 receivers with balanced input circuits. The equipment can be used over the frequency range of .1 mc to 24 mc; it provides suitable matching for the antenna system regardless of the receiver input impedances. Plug-in type r-f transformers are used for adapting the equipment to particular antenna systems. Plug-in type interstage filters are used to aid in rejection of unwanted signals. The signal path is shown in figure 11.

a. INPUT AMPLIFIER CHASSIS. The signal from the antenna transmission line is passed to the r-f transformer, one of Z17 through Z24, which is selected to match the particular antenna system. The voltage across the r-f transformer secondary is fed to the input amplifier V1, which uses one section of a dual triode. The output of V1 is fed to interstage amplifier V2, which is a dual triode connected in cascade. The output of V2 is fed to the interstage filter (one of Z1 through Z16). Selection of the interstage filter is determined by the desired operating frequency range. The signal appearing at the output of the filter is fed to transmission line amplifier V3, which is a pentode.

b. ARTIFICIAL TRANSMISSION LINE. The output of V3 is fed to artificial transmission line L101. This line consists of a coil which is tapped at equal electrical intervals; it provides a means for connecting transmission line amplifier V3 to the five phase inverter

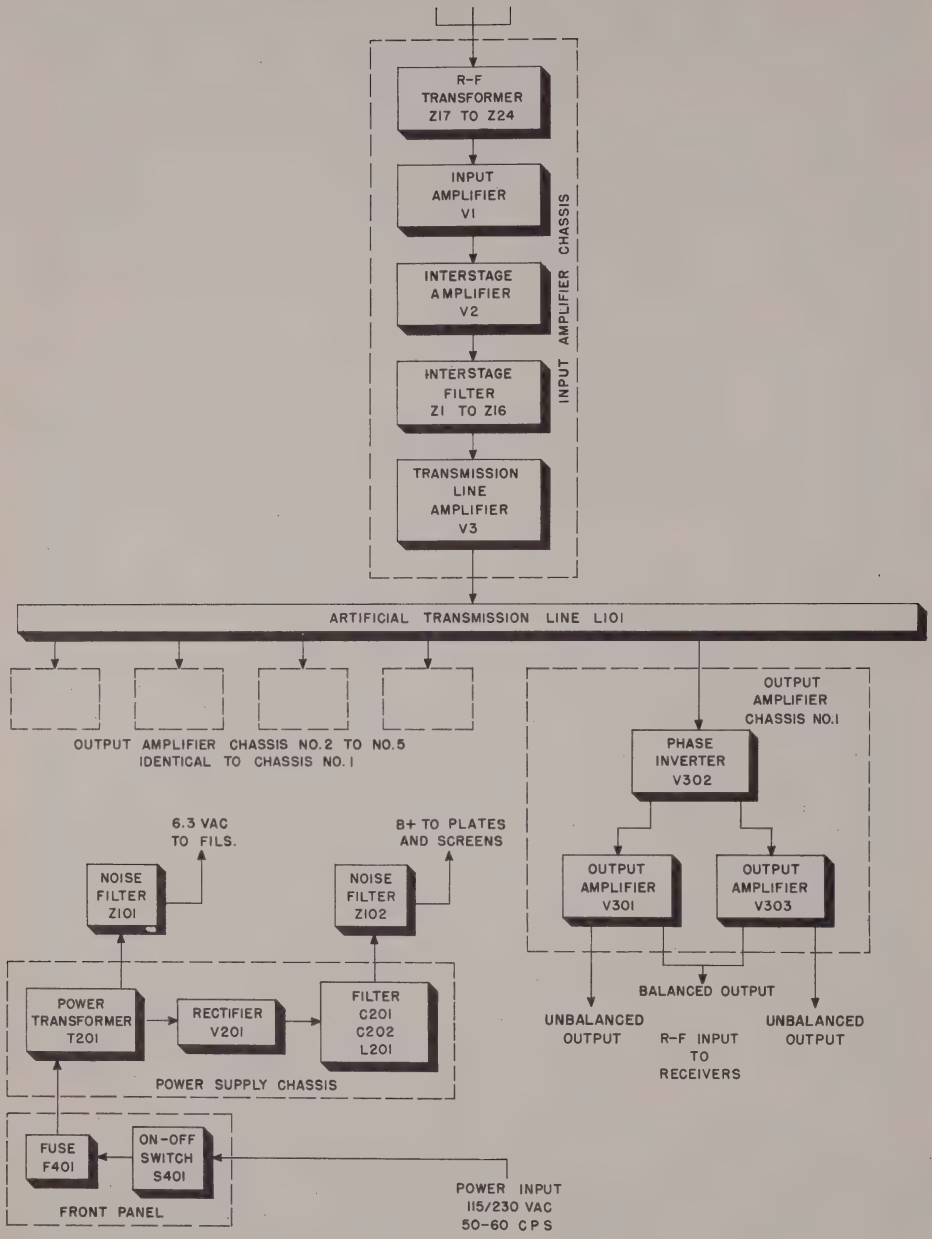


Figure 11. Antenna Coupler CU-52/URR, block diagram.

tubes (subpar. c below) without appreciable interaction between the input circuit of each amplifier.

c. OUTPUT AMPLIFIER CHASSIS. Five output amplifier chassis are provided in the equipment. The five chassis are identical electrically and mechanically. Each of the five taps of artificial line L101 is connected to the grid of each triode phase inverter, V302. The signal appearing at the plate of V302 is fed to pentode output amplifier V301. The signal appearing at the cathode of V302 is fed to pentode output amplifier V303. The signal at the plate of V301 is used to feed one receiver having an unbalanced input circuit; the signal at the plate of V303 is used to feed another receiver having an unbalanced input circuit. The signal at the plate of both V301 and V303 is used to feed a receiver having a balanced input circuit. Thus, each output amplifier chassis will feed two receivers having unbalanced input circuits or one receiver having a balanced input circuit.

d. POWER SUPPLY. The power supply provides filament and B+ voltages for the entire equipment. The primary of power transformer T201 is designed for 115-volt or 230-volt operation.

e. NOISE FILTERS. Two noise filters are provided to eliminate noise and r-f signals which may enter the equipment through the power line. Filter Z101 is in series with the filament voltage supply to the tube filaments. Filter Z102 is in series with the B+ voltage supply to the tube plates and screens.

f. FRONT PANEL. The front panel circuits include fuse F401, power switch S401, and pilot lamp E401.

48. Antenna Input Circuits

The antenna input connectors are designed to accommodate either an unbalanced (coaxial) transmission line, a shielded balanced transmission line, or an open-wire balanced transmission line. The equipment is shipped with the unbalanced line connector and the balanced shielded line connector wired into the circuit. The binding posts for use with a balanced open-wire line can be connected readily if required (par. 15).

a. Unbalanced input connector receptacle J1 is matched for use with Plug Connector UG-573/U, which is supplied, and Radio Frequency Cable RG-8/U.

b. Balanced input connector receptacle J2 is matched for use with Plug Connector UG-421/U, which is supplied, and Radio Frequency Cable RG-22/U.

c. Binding posts E1 and E2 are used to replace connector J2 in the circuit when an open-wire balanced line is used (par. 15).

49. R-f Transformers (fig. 12)

The signal at the particular antenna input connector used is fed to the r-f transformer. Eight plug-in type r-f transformers are supplied; the one which matches the antenna transmission line is plugged into connector receptacle J3 on the input amplifier chassis. A pair of transformers is supplied for each type of transmission line to cover the operating range of .1 mc to 24 mc. The transformer is an impedance matching device, designed to match the impedance of the antenna transmission line to the impedance of the grid circuit of V1.

a. R-F TRANSFORMER Z17. R-F transformer Z17 is designed for a 50-ohm unbalanced (coaxial) transmission line; it covers the frequency range of .1 mc to 3.5 mc. Antenna connector J1 is used with this transformer. The signal voltage at J1 is connected across the tap on coil L2201 and ground. Coil L2201 is connected as an autotransformer. The portion of the winding from the tap to ground acts as the primary; the entire winding acts as the secondary. The inductance of L2201 and the distributed capacitance cover the desired frequency range. The signal voltage across the secondary of L2201 is fed to input amplifier V1.

b. R-F TRANSFORMER Z18. R-f transformer Z18 is designed for a 50-ohm unbalanced (coaxial) transmission line; it covers the frequency range of 2.4 mc to 24 mc. Coil L2301 is connected in a manner similar to that of L2201 in Z17. Fewer turns are used on the winding; this factor and the lower distributed capacity permits the coil to resonate at the higher frequency required. Shunting resistor R2301 across the secondary broadens the over-all frequency response to cover the frequency range.

c. R-F TRANSFORMER Z19. R-f transformer Z19 is designed for a 100-ohm balanced transmission line; it covers the frequency range of .1 mc to 3.5 mc. Coil L2401 is connected as an autotransformer. To provide a balanced circuit, an additional winding is used. This winding is wound together with

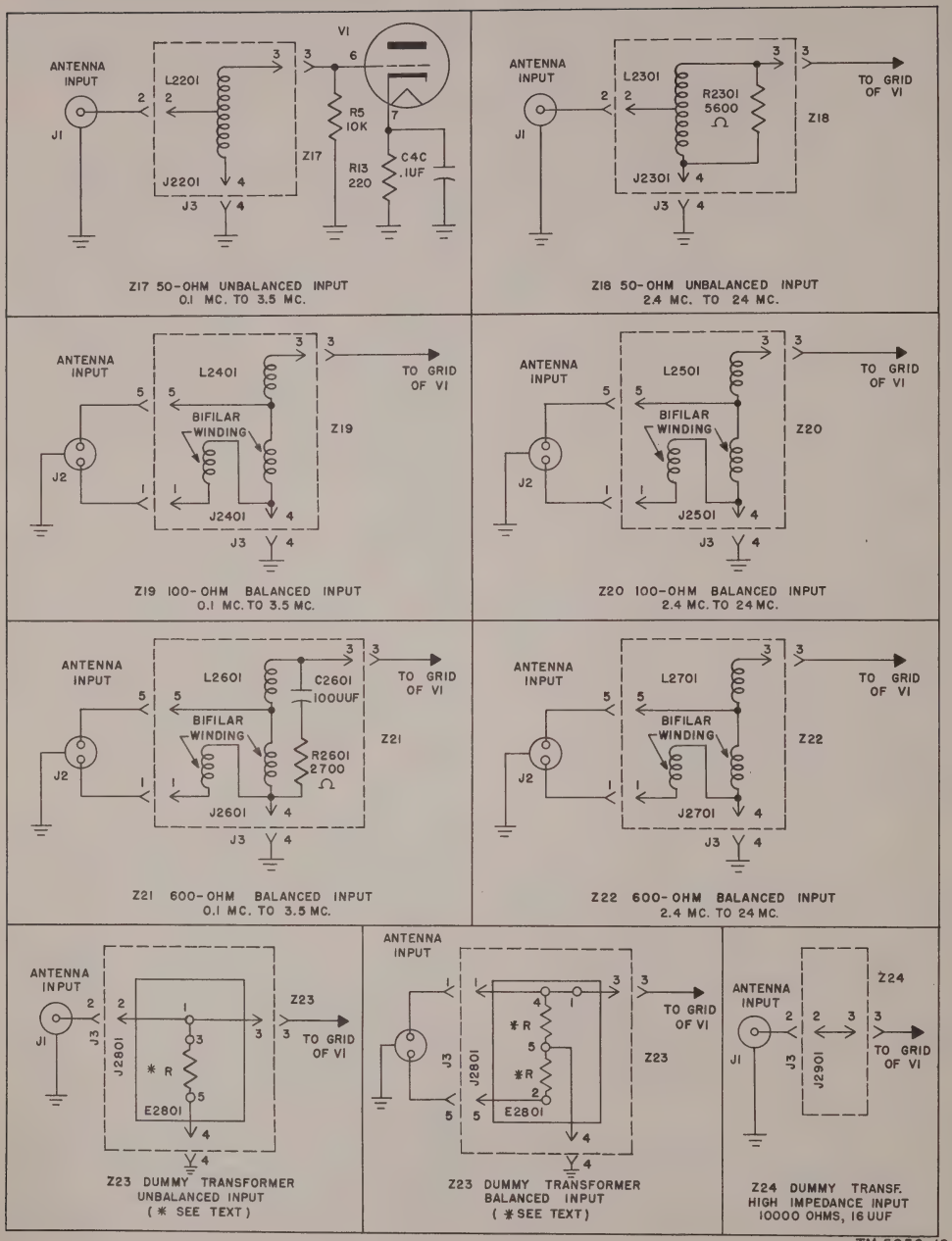


Figure 12. R-f transformers, functional diagrams.

the bottom section of the coil to obtain very close coupling. The two coils thus arranged are designated as a bifilar winding on the diagram. One side of the balanced line is connected to one end of the added winding, and the other end of the winding is connected to the bottom of the autotransformer secondary and to ground. The other side of the balanced line is connected to a tap of the winding. The result of this arrangement is that both sides of the transmission line feed the same amount of r-f voltage to the primary of the autotransformer; at the same time, each side of the transmission line has the same impedance to ground, so that the balance of the line is not disturbed.

d. R-F TRANSFORMER Z20. R-f transformer Z20 is designed for a 100-ohm balanced transmission line; it covers the frequency range of 2.4 mc to 24 mc. It is similar in arrangement to Z19. The turns on coil L2501 are adjusted so that the desired frequency range is covered. By using a winding with a low Q or efficiency factor, a wider frequency response is obtained.

e. R-F TRANSFORMER Z21. R-f transformer Z21 is designed for a 600-ohm balanced line over the frequency range of .1 mc to 3.5 mc. The arrangement of the autotransformer and bifilar winding is similar to that of the units already described. The number of turns on the winding provide the higher impedance for the 600-ohm line. The desired frequency response characteristic is obtained by connecting C2601 in series with R2601 across the secondary.

f. R-F TRANSFORMER Z22. R-f transformer Z22 is designed for a 600-ohm balanced line over the frequency range of 2.4 mc to 24 mc. The same arrangement is used as described for transformers Z19 and Z20. A low Q winding is used to obtain the broad frequency response.

g. R-F TRANSFORMER Z23. R-f transformer Z23 is designed for use where none of the other transformers described is suitable for the particular transmission line. The unit as supplied consists of a blank terminal board mounted on the connector base within the shield can. Resistors must be wired to the terminal board to meet the requirements of the particular transmission line (par. 14b).

(1) For use with an unbalanced line, transformer Z23 is wired as shown in the bottom left section of figure 12. Resistor R is made equal to the impedance of the transmission line. The resistor thus serves to terminate the transmission line with the correct impedance for proper matching.

(2) For use with a balanced line, transformer Z23 is wired as shown in the bottom center section of figure 12. Two resistors are used, each equal to one-half of the impedance of the transmission line. One resistor is connected from each side of the transmission line to ground. The resistors thus terminate each side of the line with the correct impedance for proper matching. The result of this arrangement is that only one-half of the total voltage at the end of the line is fed to the grid input circuit of V1.

h. R-F TRANSFORMER Z24. R-f transformer Z24 is also used when a high-impedance, unbalanced input circuit is required for a particular antenna system. This unit normally will be used in conjunction with a monopole antenna. As shown in figure 12, the transformer consists of a jumper that provides for a straight-through connection from antenna connector J1 to the grid of input amplifier V1. Thus, the impedance presented to the transmission line at connector J1 is that of the input circuit of V1. This impedance is comprised of the 10,000-ohm grid-return resistor R5 and a distributed capacity of approximately 16 uuf (micromicrofarads).

50. Input Amplifier Stage (fig. 13)

The signal voltage appearing at the secondary of the particular r-f transformer used is applied to the grid (pin 6) of input amplifier V1, which uses one section of a type 6J6 dual triode. (The other section of this tube is not used.) Resistor R5 completes the grid-return circuit to ground. The input stage is a class A r-f amplifier. Operating bias is developed across cathode resistor R13. Cathode by-pass capacitor C4C provides a low-impedance path for the r-f signal across R13. Resistor R1 is used as a parasitic suppressor to prevent the amplifier stage from producing spurious oscillation. The plate load resistor is R3. The value of peaking coil L1 is chosen with relation to the value of R3 to extend the frequency response of the amplifier. This results in a gain characteristic for the stage

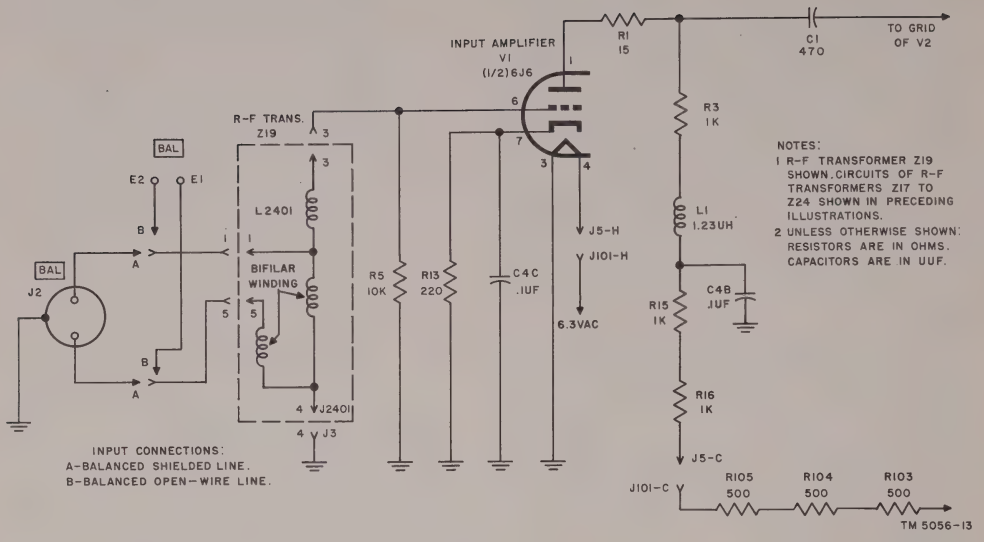


Figure 13. Input amplifier stage, functional diagram.

which is relatively flat over the operating range of .1 mc to 24 mc. Resistor R15 and capacitor C4B provide a decoupling filter to eliminate any interaction of circuits because of the common power supply. The plate voltage is dropped to a suitable value by series resistors R16 and R103, and R104 and R105. The amplified signal at the plate of V1 is fed to the following stage through coupling capacitor C1.

51. Interstage Amplifier (fig. 14)

a. Interstage amplifier V2 uses a type 6J6 dual triode connected in cascade. The output of V1 is coupled to the grid (pin 5) of the first triode section. The d-c (direct-current) grid return is completed through R6. Operating bias for both sections of the tube is developed across cathode resistor R14. The cathode bypass capacitor is C4A. The parasitic suppressor is resistor R2. The plate load is resistor R8. The peaking coil L2 and resistor R8 are selected to extend the frequency response of the stage to cover the desired range. Resistor R15 and capacitor C4B provide a decoupling filter. The plate voltage is reduced to the correct value by resistors R103 through R105 and R16.

b. The amplified signal at the plate (pin 2) of the first triode section is applied to the grid (pin 6) of the second triode section through coupling capacitor C3. The d-c grid return for the second triode section is resistor R7. The parasitic suppressor for the second triode section is resistor R4. The signal at the plate (pin 1) of the second triode section is fed to the input of the interstage filter (par. 52). For filter Z4 shown, the plate voltage is applied through coil L601A shunted by resistor R601. Resistor R12 and capacitor C5A serve as a B+ decoupling filter. The plate voltage is reduced to the correct value by series dropping resistors R103, R104, and R105.

52. Interstage Filters (figs. 15, 16, and 17)

Because Antenna Coupler CU-52/URR essentially is a broadband amplifier, it is subject to cross-modulation effects on strong signals (par. 46). To reduce these effects, a set of 16 interstage filters is provided to reject such signals. Each filter is designed to pass a certain band of frequencies. Signals outside that frequency band will not be passed to the receivers. The filters are designed to pass frequency bands from very broad (.1 mc

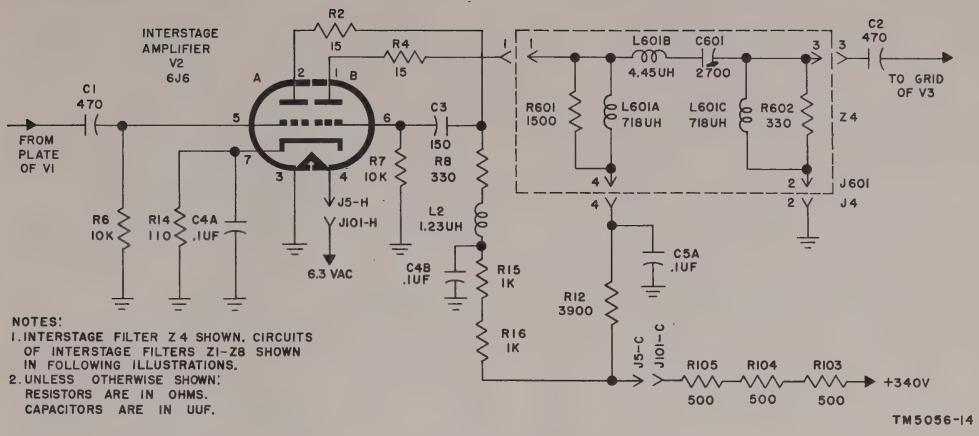


Figure 14. Interstage amplifier, functional diagram.

to 24 mc) to very narrow. For optimum freedom from unwanted signals, the filter having the narrowest band pass which will cover the desired operating range should be used.

a. BASIC CONCEPTS.

(1) The filters in the antenna coupler use various combinations of capacitors, inductors, and resistors to obtain the desired frequency-response characteristics for each application. In addition to having these frequency-response characteristics, it is necessary that the impedance input of the filter match the impedance of the signal source, the plate output circuit of V2B; and the impedance at the output of the filter match the impedance of the load, the grid input circuit of V3.

(2) The action of capacitors and inductors at various frequencies is utilized in each filter. The reactance of an inductor increases as the frequency increases; therefore, low frequencies are passed more readily and high frequencies are attenuated. The reactance of a capacitor decreases as the frequency increases; hence, high frequencies are passed more readily, and low frequencies are attenuated.

(3) If the resistance in the filter circuit is kept at a minimum, a sharper dividing line is obtained between the frequencies which are passed and those which are attenuated. Conversely, resistance can be added intentionally if it is desired to broaden the frequency band pass of a practical filter.

(4) Section A of figure 15 shows the circuit of a low-pass filter. This filter is designed to pass all frequencies below the critical frequency, or cutoff frequency, and to attenuate frequencies above the cutoff frequency. At low frequencies, the reactance of inductor L is low, and that of capacitor C is high; therefore, the low impedance of the series branch will pass the lower frequencies, and the high impedance of the shunt branch prevents the low frequencies from being bypassed around the load. At high frequencies, the reactance of inductor L is high, and that of capacitor C is low; therefore, the high impedance of the series branch attenuates the high frequencies, and the low impedance of the shunt branch bypasses the high frequencies around the load. The result of this combination is to produce the frequency-current characteristics shown opposite the circuit diagram. The actual value of the cutoff frequency is determined by the constants of the circuit.

(5) Section B of figure 15 shows the circuit of a high-pass filter. This fil-

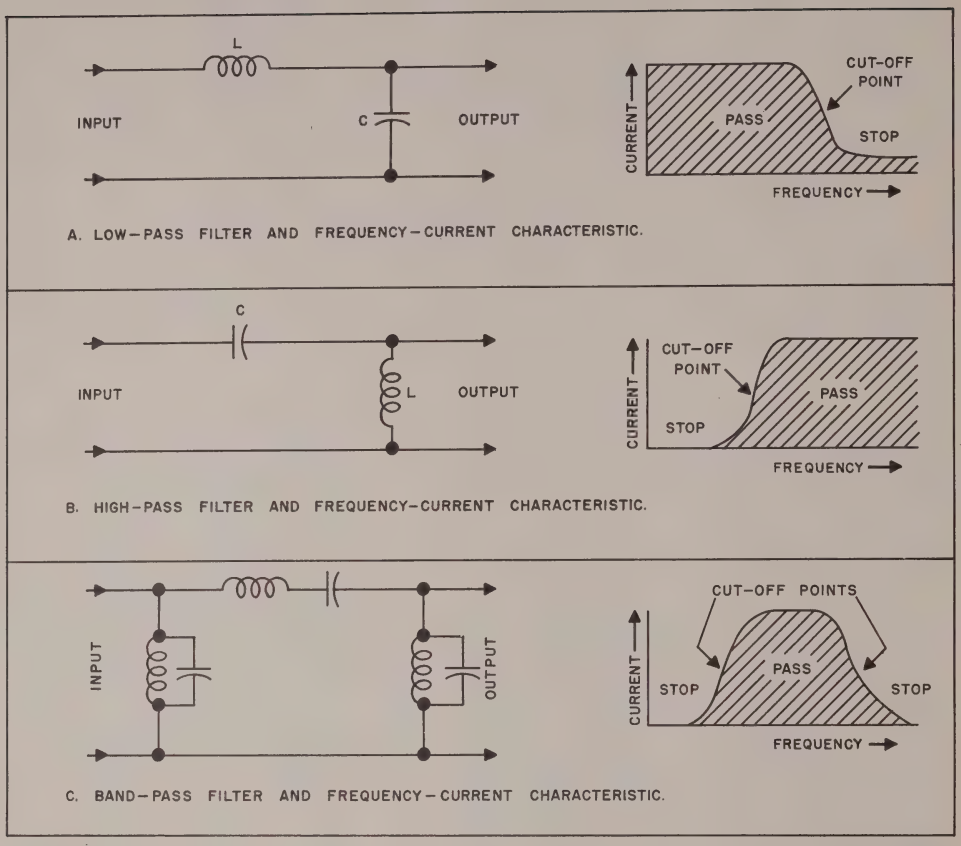


Figure 15. Basic filter sections, schematic diagrams.

ter is designed to pass all frequencies above the cutoff frequency and to attenuate frequencies below the cutoff frequency. As shown in figure 15B, the position of the inductor and capacitor of the low-pass filter have been interchanged. At low frequencies, the reactance of capacitor C is high, and the reactance of inductor L is low. Therefore, the low frequencies will be attenuated. At high frequencies, the reactance of capacitor C is low, and the reactance of inductor L is high; therefore the high frequencies will be passed. The result of this combination is to produce the frequency-current characteristic shown opposite the circuit diagram.

(6) The constants shown in sections A and B of figure 15 can be combined with other constants to obtain resonant (tuned) circuits. Such circuits provide greater selectivity. A capacitor and inductor in series (series-resonant circuit) offer low impedance to currents of the resonant frequency and relatively high impedance to currents of all other frequencies. Con-

versely, a capacitor and inductor in parallel (parallel-resonant circuit) offer high impedance to currents of its resonant frequency and relatively low impedance to currents of all other frequencies.

(7) Section C of figure 15 shows the circuit of a band-pass filter. Such a filter is designed to pass currents of frequencies within a particular frequency band, limited by an upper and lower cutoff frequency, and to attenuate currents of all frequencies below and above that band. The frequencies within the band pass of the filter are termed the pass frequencies. As shown in figure 15, the circuit contains two parallel-resonant circuits and a series-resonant circuit. Each resonant circuit is tuned to the desired frequency band. The parallel-tuned circuits offer high impedance to the frequencies within this band; the series-tuned circuits offer low impedance to those frequencies. Therefore, only the pass frequencies are attenuated very little. The result of the combination is to produce the frequency-current characteristic shown in the figure.

(8) The circuit of each of the filters supplied with the antenna coupler is basically the same as the band-pass filter circuit shown in section C of figure 15. The constants of the series and shunt arms are selected to provide the band pass required for each particular filter.

b. PRACTICAL FILTERS. The circuits of the interstage filters used in the antenna coupler are shown in figures 16 and 17.

(1) Interstage filter Z1. The interstage filter Z1 is designated as broad; it passes frequencies between .1 mc to 1.6 mc. Coil L701A forms the plate load for interstage amplifier V2B. Resistor R702 provides the termination for the filter. The output signal across R702 is fed to transmission line amplifier V3.

(2) Interstage filter Z2. Interstage filter Z2 is designated as broad; it passes frequencies between .4 mc and 6 mc. The configuration of Z2 is the same as that of Z1. The constants are selected to pass the specified band of frequencies.

(3) Interstage filter Z3. Interstage filter Z3 is designated as broad; it passes frequencies between 1.5 mc and 24 mc.

(4) Interstage filter Z4. Interstage filter Z4 is designated as very broad; it covers the complete operating range of .1 mc to 24 mc. The input signal is applied across coil L601A, shunted by resistor R601. The terminating resistor is R602.

(5) Interstage filter Z5. Interstage filter Z5 is designated as medium; it passes frequencies between .1 mc and .4 mc. The arrangement of circuit constants is the same as for filter Z1. The value of the constants is selected to pass the smaller band of the required frequencies.

(6) Interstage filter Z6. Interstage filter Z6 is designated as medium; it passes frequencies between .4 mc and 1.6 mc. Z6 is similar to filter Z1.

(7) Interstage filter Z7. Interstage filter Z7 is designated as medium; it passes frequencies between 1.6 mc and 6.4 mc. Z7 is similar to filter Z1.

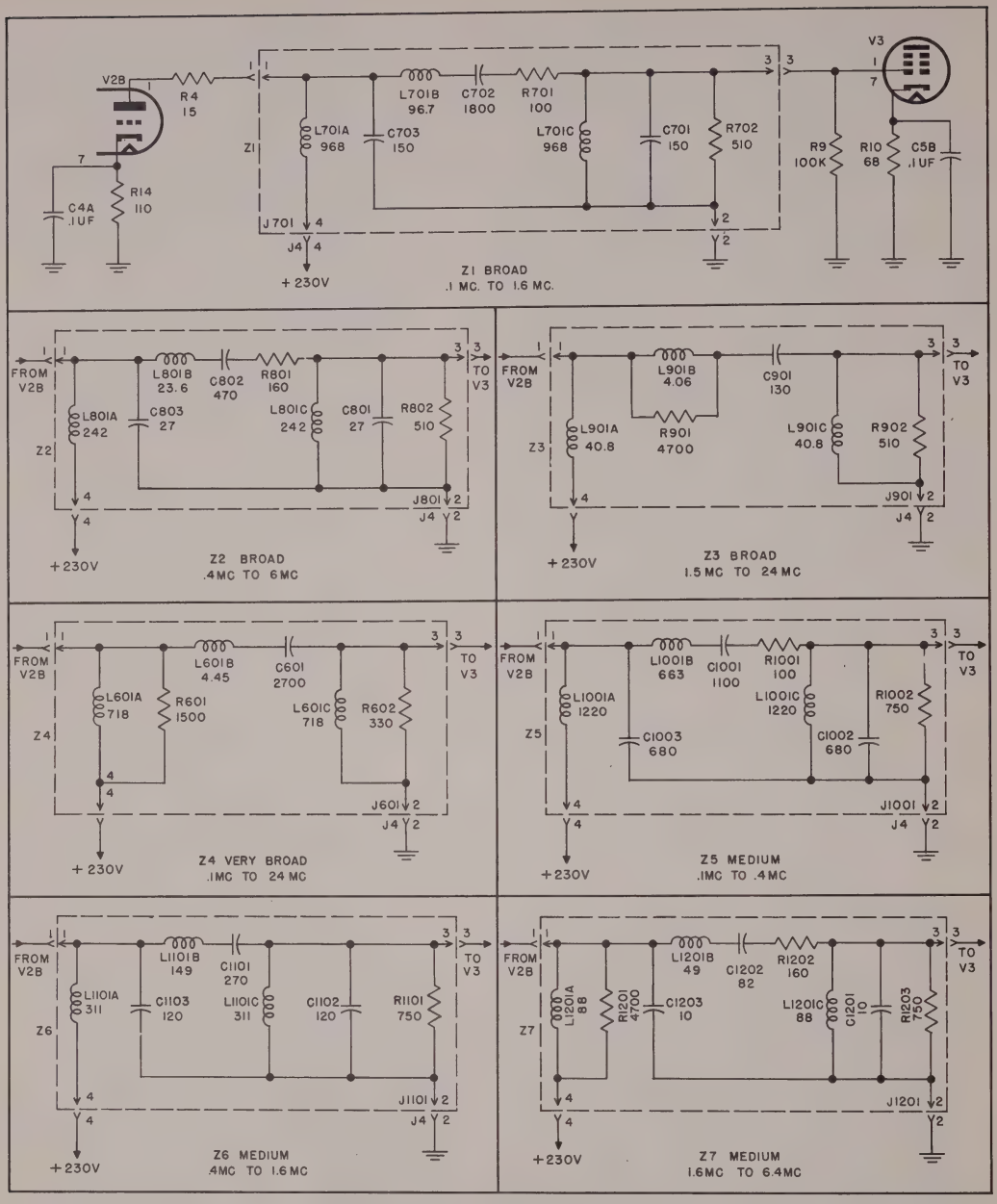
(8) Interstage filter Z8. Interstage filter Z8 is designated as medium; it passes frequencies between 6 mc and 24 mc. Termination is provided by resistor R1303.

(9) Interstage filter Z9. Interstage filter Z9 is designated as narrow; it passes frequencies between .1 mc and .2 mc. It is a symmetrical pi arrangement, terminated by resistor R1401.

(10) Interstage filter Z10. Interstage filter Z10 is designated as narrow; it passes frequencies between .2 mc and .4 mc. Z10 is similar to filter Z9.

(11) Interstage filter Z11. Interstage filter Z11 is designated as narrow; it passes frequencies between .4 mc and .8 mc. Z11 is similar to filter Z9.

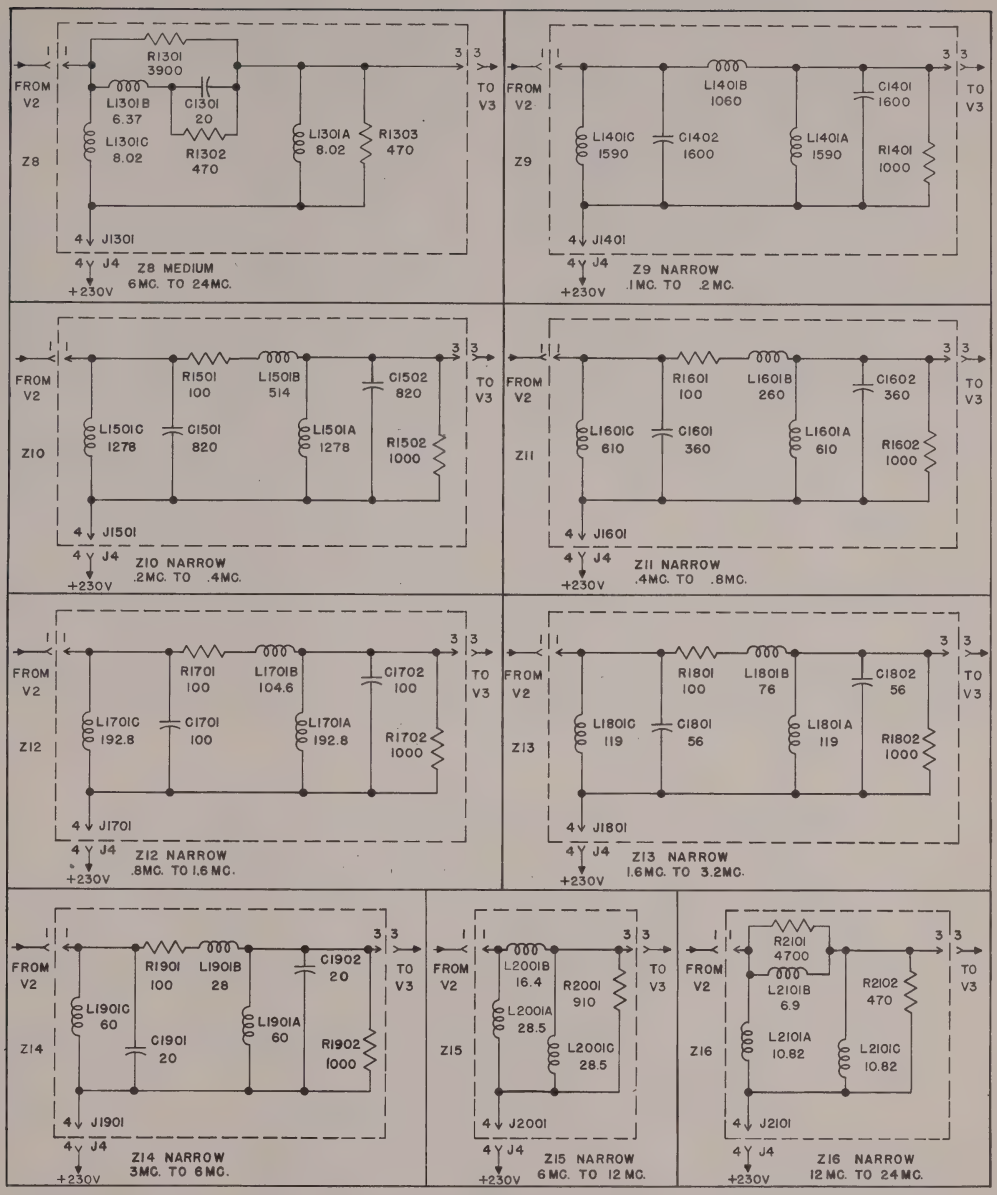
(12) Interstage filter Z12. Interstage filter Z12 is designated as narrow; it passes frequencies between .8 mc and 1.6 mc. Z12 is similar to filter Z9.



NOTE
UNLESS OTHERWISE SHOWN:
RESISTORS ARE IN OHMS.
CAPACITORS ARE IN UUF.
COILS ARE IN UH.

TM 5056-16

Figure 16. Intersiage filters Z1 to Z7, functional diagrams.



NOTES:
UNLESS OTHERWISE SHOWN:
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF,
COILS ARE IN UH.

TM 5056-17

Figure 17. Interstage filters Z8 to Z16, functional diagrams.

(13) Interstage filter Z13. Interstage filter Z13 is designated as narrow; it passes frequencies between 1.6 mc and 3.2 mc. Z13 is similar to filter Z9.

(14) Interstage filter Z14. Interstage filter Z14 is designated as narrow; it passes frequencies between 3 mc and 6 mc. Z14 is similar to filter Z9.

(15) Interstage filter Z15. Interstage filter Z15 is designated as narrow; it passes frequencies between 6 mc and 12 mc. Z15 is a simple pi filter, terminated by resistor R2001.

(16) Interstage filter Z16. Interstage filter Z16 is designated as narrow; it passes frequencies between 12 mc and 24 mc. Z16 is similar to filter Z15, with the addition of resistor R2101 in the series portion of the section. Termination is provided by resistor R2102.

53. Transmission Line Amplifier (fig. 18)

The signal voltage appearing at the output of the interstage filter is fed through coupling capacitor C2 to the grid of the transmission line amplifier V3, which uses a type 6BA6 pentode. The stage is operated as a class A r-f amplifier. The d-c grid return is completed through resistor R9. Operating bias is developed across cathode resistor R10, bypassed for r-f current by capacitor C5B. The plate load for V3 is provided by artificial transmission line L101 (par. 54). Screen voltage is obtained through resistor R11 and series dropping resistors R103, R104, and R105. Resistor R11 and capacitor C5C form a B+ decoupling filter.

54. Artificial Transmission Line (fig. 18)

a. Artificial transmission line L101 provides a means of connecting the output of transmission line amplifier V3 to the grid of each phase inverter tube (par. 55). The transmission line effectively isolates the grids of the five phase inverter tubes from each other, so that signal voltage is transferred efficiently to each grid without interaction between the grid input circuits. The line also serves as the plate load for V3. The line is terminated by resistor R101, with capacitors C107 and C108 completing the r-f return path to ground. Plate voltage for V3 is supplied through the line and resistors R101 and R102.

b. Coil L101 consists of six sections, each section having the same inductance. The output of V3 is fed to the beginning of coil L101. Each phase inverter tube grid receives its signal voltage from one section of L101. Filtering for each section is provided by capacitors C101 through C106.

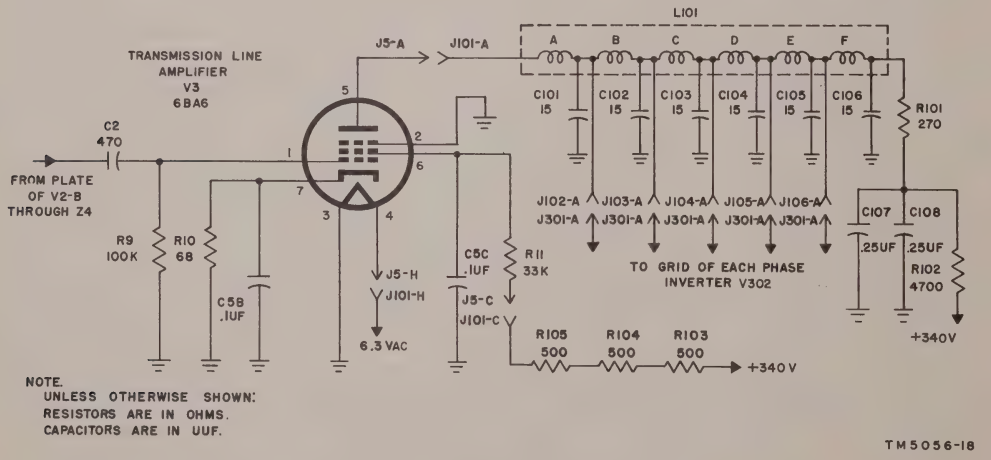


Figure 18. Transmission line amplifier and artificial transmission line, functional diagram.

55. Phase Inverter (fig. 19)

a. The phase inverter is used to supply signal voltage to the grids of the output amplifier tubes, which are operated in push-pull. Tubes operated in this manner require that the voltage at each grid be of the same magnitude but of opposite polarity. This requirement can be fulfilled by a single tube connected as shown in figure 19. The signal voltage for one push-pull grid is obtained from the plate circuit of the phase inverter. The signal voltage for the other push-pull grid is obtained from the cathode circuit of the phase inverter. The plate load and cathode resistors are approximately equal; therefore, the signal voltages across the plate and cathode resistors are approximately equal, since the same current flows through them. The plate voltage at any instant is opposite in polarity to the cathode voltage. Thus, the phase inverter fulfills the requirement for two voltages of opposite polarity and approximately equal magnitude.

b. One phase inverter, V302, is used in each output amplifier chassis. The phase inverter uses a type 6C4 triode. The grid of each phase inverter receives its signal voltage from a tap on artificial transmission line L101, through coupling capacitor C305. The d-c grid return is completed through resistor R312. Operating bias is provided by cathode resistor R313. The signal voltage for output amplifier V303 is developed across R313. The cathode resistor is not bypassed to avoid shunting this signal voltage to ground. Series peaking coil L302 extends the frequency response at the low end. The signal voltage is fed to the grid of V303 through L302 and coupling capacitor C307. The plate load for V302 is resistor R307. Plate voltage is supplied through resistor R308, which forms a B+ decoupling filter in conjunction with capacitor C301B. The signal voltage at the plate of V302 is fed through low-frequency peaking coil L301 and coupling capacitor C304 to the grid of output amplifier V301.

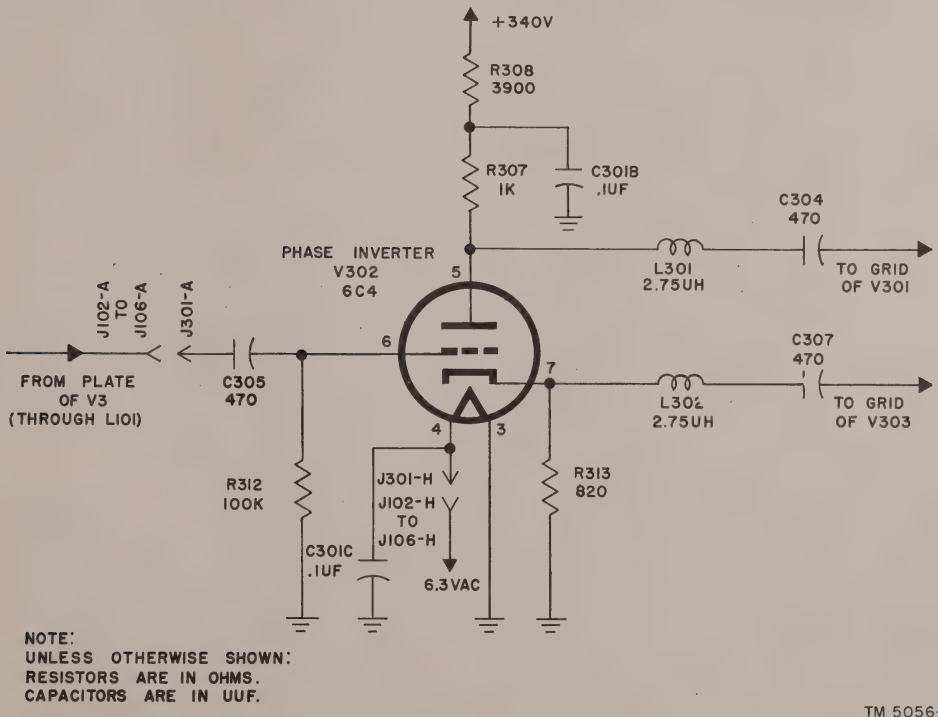


Figure 19. Phase inverter, functional diagram.

56. Output Amplifier Stage (fig. 20)

The output amplifier stage consists of two type 6BA6 pentodes connected in a push-pull circuit.

a. The signal voltage from the plate of V302 is fed through peaking coil L301 and coupling capacitor C304 to the control grid of output amplifier V301. The d-c grid return is completed through resistor R304. Operating bias is developed across cathode resistor R305, which is bypassed by capacitor C302A. The suppressor is connected directly to ground. Screen voltage is obtained through resistors R306, R105, R104, and R103. The screen is bypassed to ground by capacitor C302B. Filament bypass capacitor C301C is common to the filament circuits of all the tubes in the equipment. The plate load resistor is R302. Resistor R301 and capacitor C302C form a plate decoupling filter to prevent r-f voltage from entering the power supply. The signal at the plate of V301 is fed to connector J302 through coupling capacitor C303 for unbalanced receiver input circuits (par. 57). Resistor R303 serves as a bleeder to discharge capacitor C303.

b. The signal voltage from the cathode of V302 is fed through peaking coil L302 and coupling capacitor C307 to the control grid of output amplifier V303. The d-c grid return is completed through resistor R314. Operating bias is developed across cathode resistor R315, bypassed by capacitor C308C. The suppressor is grounded. Screen voltage is obtained through resistors R316, R105, R104, and R103. The screen bypass capacitor is C308B. The plate load resistor is R310. Resistor R309 and capacitor C308A form the plate decoupling filter. The signal at the plate of V303 is fed to connector J304 through coupling capacitor C306 for unbalanced receiver input circuits (par. 57). R311 is the bleeder resistor for C306.

57. Receiver Connections (fig. 20)

The output circuits of the push-pull amplifier stage can be used for connecting receivers having either unbalanced or balanced antenna

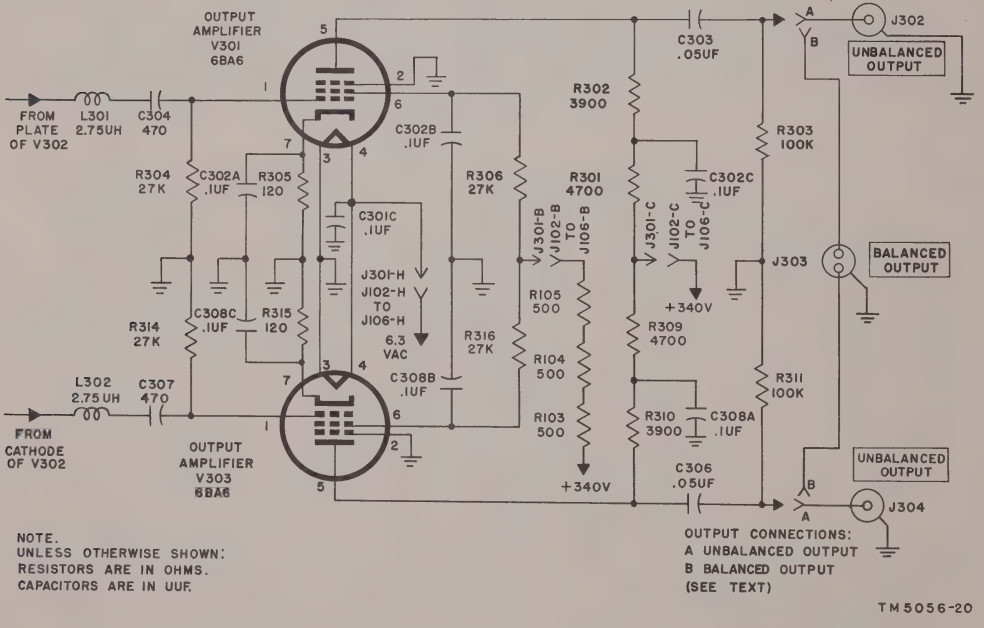


Figure 20. Output amplifier stage, functional diagram.

input circuits. The equipment is shipped with the connections arranged for unbalanced receiver systems. Connections for balanced receiver systems are made easily (par. 15b(2)).

a. UNBALANCED OUTPUT. For unbalanced receiver antenna systems, one receiver is connected to the plate of V301 at connector J302; another receiver is connected to the plate of V303 at connector J304. The single-ended circuit at one plate of a tube is unbalanced because of the different impedances to ground of the two sides of the output circuit; hence, with the two-tube output amplifier stage used, two separate unbalanced output circuits are available.

b. BALANCED OUTPUT. For balanced receiver antenna systems, connector J303 is used instead of connectors J302 and J304. Connector J303 is identical in construction to connector J2 used for a balanced antenna transmission line (par. 48b). The signal at the plate of V301 is fed to one terminal of J303; the signal at the plate of V303 is fed to the other terminal of J303. With the output of the push-pull stage thus connected, both sides of the line connected to J303 have the same impedance to ground, and a balanced output circuit is obtained. Thus, the balance of the system is maintained from the plates of the amplifier tubes, through the transmission line, to the balanced receiver input circuit.

58. Power Supply (fig. 21)

a. The power supply provides plate and filament voltages for the entire equipment. Power transformer T201 is designed for operation from 115 or 230 volts, as determined by the setting of switch S201. The transformer has two primary windings. When S201 is in the 115-volt position, the two primary windings are connected in parallel. When S201 is in the 230-volt position, the two primary windings are connected in series. Three secondary windings provide filament voltage for the equipment and filament and plate voltages for the rectifier.

b. Rectifier V201 uses a type 5R4WGY tube in a full-wave circuit. Resistor R201 serves as a bleeder to discharge the filter capacitors.

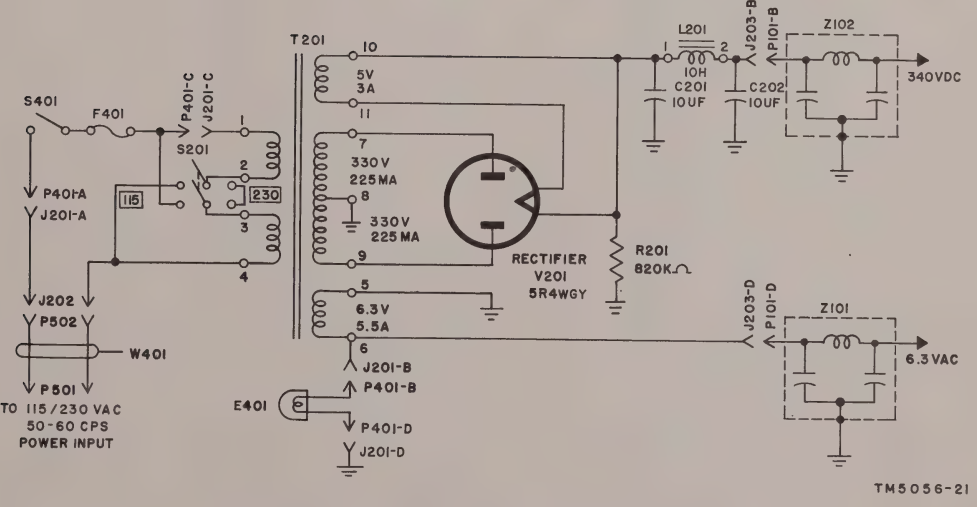


Figure 21. Power supply and control circuits, functional diagram.

Filtering of the rectified output voltage is provided by capacitors C201 and C202 and reactor L201. The B_+ output of the power supply if fed to pin B of connector J203. The filament supply is fed to pin D of connector J203. These voltages are then fed to the equipment through connector P101, cable W101, and noise filters Z101 and Z102 (par. 59).

59. Noise Filters
(fig. 21)

Two noise filters are used at the output of the power supply. Filter Z101 is in series with the filament voltage supply to the tubes. Filter Z102 is in series with the B_+ voltage supply to the tube plates and screens. Each filter is of the pi type, having a capacitor in each shunt branch and an inductance in the series branch. The constants of each filter are selected to prevent noise and r-f signals from entering the equipment through the power line.

60. Front Panel Circuits
(fig. 21)

The front panel circuits includes those for switch S401, fuse F401, pilot lamp E401, and cable W401. Switch S401 completes the primary circuit to power transformer T201. Fuse F401 is in series with one side of the a-c line to protect the equipment against damage because of shorts, abnormal line voltage, etc. Pilot lamp E401 lights when the equipment is in operation. Connections from the front panel circuits are completed to the power supply chassis through cable W401, which is terminated by connector P401.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Note. This chapter contains information for field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning. When servicing the equipment, be careful of the high voltage involved. Disconnect the power cable completely, except when making voltage checks. Keep one hand in pocket when measuring voltages with a probe. Before touching any part after the voltage is shut off, short the part to ground.

61. Trouble-shooting Procedure

The first step in servicing the equipment is to sectionalize the fault. Sectionalization means tracing the fault to the major component or circuit responsible for the abnormal operation of the equipment. The second step is to localize the fault. Localization means tracing the fault to the defective part responsible for the abnormal condition. Some faults such as burned-out resistors and shorted transformers often can be located by sight, smell, and hearing. The majority of faults, however, must be localized by checking voltage and resistance.

a. SYSTEM SECTIONALIZATION. System sectionalization is discussed in paragraphs 40, 41, and 42.

b. COMPONENT SECTIONALIZATION AND LOCALIZATION. The tests listed below aid in isolating the source of trouble. To be effective, the procedure should be followed in the order given. Remember that servicing procedure should cause no further damage to the equipment. First, trouble should be localized to a single stage or circuit. Then the trouble may be isolated within that stage or circuit by appropriate voltage, resistance, and continuity measurements. The servicing procedure is summarized as follows:

(1) Visual inspection. The purpose of visual inspection (par. 40) is to locate any visible trouble. Through this inspection alone, the repairman frequently may discover the trouble, or determine the stage in which the trouble exists. This inspection is valuable in avoiding additional damage to the equipment which may occur through improper servicing methods and in forestalling future failures.

(2) Input resistance measurements. These measurements (par. 66) prevent further damage to the equipment from possible short circuits. Since this test gives an indication of the condition of the filter circuits, its function is more than preventive.

(3) Trouble-shooting chart. The trouble symptoms listed in this chart (par. 67) will aid greatly in localizing trouble.

(4) Signal substitution. The principal advantage of the signal substitution method (par. 68) is that it usually enables the repairman to localize a trouble accurately and quickly to a given stage when the general location of the trouble is not immediately evident from the above tests.

(5) Intermittents. In all these tests, the possibliity of intermittents should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the

set. It is possible that the trouble is not in the antenna coupler itself but in the installation, or the trouble may be due to external conditions. In this event, test the installation, if possible.

62. Trouble-shooting Data

Take advantage of the material supplied in this manual. It will help in the rapid location of faults. Consult the following trouble-shooting data:

Fig. or par. No.	Description
Fig. 22	Antenna Coupler CU-52/URR, top view.
Fig. 23	Main chassis, top view.
Fig. 24	Main chassis, bottom view.
Fig. 25	Input amplifier chassis, top view.
Fig. 26	Input amplifier chassis, bottom view.
Fig. 27	Input amplifier chassis, bottom view.
Fig. 28	Output amplifier chassis, top view.
Fig. 29	Output amplifier chassis, bottom view.
Fig. 30	Output amplifier chassis, bottom view.
Fig. 31	Power supply chassis, top view.
Fig. 32	Power supply chassis, bottom view.
Fig. 33	Power supply chassis, voltage and resistance diagram.
Fig. 34	Main chassis, voltage and resistance diagram.
Fig. 35	Output amplifier chassis, voltage and resistance diagram.
Fig. 36	Input amplifier chassis, voltage and resistance diagram.
Fig. 37	B+ voltage distribution diagram.
Fig. 41	Antenna Coupler CU-52/URR, schematic diagram.
Fig. 42	R-f transformers, schematic diagrams.
Fig. 43	Interstage filters, schematic diagrams.
Par. 64	Use of patch cords.
Par. 66	Checking filament and B+ circuits for shorts.
Par. 67	Trouble-shooting chart.
Par. 68	Signal substitution.
Par. 69	D-c resistances of transformer and coils.
Par. 70	Stage gain measurements.

63. Test Equipment Required for Trouble Shooting

The test equipment for trouble shooting the antenna coupler is listed below. The technical manuals associated with the test equipment also are listed.

Test equipment	Technical literature
Electronic Multimeter TS-505/U	TM 11-5511
Tube Tester I-177	TM 11-2627
Radio Receiver R-211A/U	TM 11-487A
Signal Generator TS-588/U	TM 11-5018 IB
R-f Voltmeter (Hewlett-Packard 410B or equivalent)	

64. Use of Patch Cords

a. The patch cords supplied (Special Purpose Electrical Cable Assembly CX-2095/U) are to be used when it is necessary to make voltage or signal-tracing checks beneath the input amplifier chassis or one of the output amplifier chassis. The use of the patch cord permits the amplifier chassis to operate in a normal manner while removed from the main chassis.

b. To use a patch cord, remove the particular amplifier chassis to be checked from the main chassis, as described in paragraph 15. Connect the female plug on one end of the patch cord to the receptacle on the amplifier chassis. Connect the male plug at the other end of the patch cord to the receptacle on the main chassis from which the amplifier chassis was disconnected. The amplifier chassis now is ready for normal operation, with all parts accessible.

65. General Precautions

Whenever the equipment is serviced, observe the following precautions very carefully:

a. Before a part is unsoldered, note the

position of the leads. If the part, such as a transformer, has a number of connections, tag each of the leads to it.

b. Be careful not to damage other leads by pulling or pushing them out of the way.

c. Do not allow drops of solder to fall into the set, since they may cause short circuits.

d. A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

e. When a part is replaced, particularly in r-f circuits, it must be placed exactly as the original one was. A part which has the same electrical value but different physical size may cause trouble in high-frequency circuits. Give particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to observe these precautions may result in decreased gain or oscillation of the circuit.

66. Checking Filament and B+ Circuits for Shorts

Trouble within the antenna coupling unit often may be located by checking the resistance of the filament and high-voltage circuits before applying power to the equipment, thereby preventing damage to the power supply. Make the following checks before placing the equipment in operation. Disconnect the power supply cable before making the checks.

a. Measure the d-c resistance of power transformer T201 with switch S201 in the 230-volt position. The d-c resistance measured between terminals 1 and 2 or terminals 3 and 4 should be approximately 2.6 ohms. A very low resistance indicates a short. A reading near infinity indicates an open winding.

Note. If one of the primary windings is open, the equipment still can be operated from a 115-volt supply, but cannot be operated from a 230-volt supply.

b. The d-c resistance measured between terminals 5 and 6 should be approximately .05 ohm, with power supply connector P101 removed. To check for a short, it will be necessary to apply power and measure the a-c voltage from terminal 6 to ground.

c. The d-c resistance measured between terminal 2 of reactor L201 and ground should be approximately 820,000 ohms with all the chassis assemblies connected. A low reading indicates a short in C201. A zero reading indicates a short in C202 or in the B+ circuits. A higher reading indicates an open resistor in one of the voltage divider circuits.

67. Trouble-shooting Chart

The following chart is supplied as an aid in locating trouble in the antenna coupling unit. This chart lists the symptoms which the repairman observes while making a few simple tests. The chart also indicates how to localize trouble to a particular stage. The signal substitution test outlined in paragraph 68 then can be used to supplement this procedure. Once the trouble has been localized to a stage or circuit, a tube check and voltage and resistance measurements of this stage or circuit should be sufficient to isolate the defective part. Normal voltage and resistance measurements are shown in figures 33 through 36.

a. Steps 1 through 10 outline those symptoms which can be observed without disassembly. The remedial measures, however, may require removing the suspected subchassis from the main chassis before proceeding with voltage and resistance measurements.

b. Steps 11 through 50 outline those symptoms which must be determined by voltage and resistance measurements. The steps proceed in sequence through the power supply, main chassis, output amplifier, and input amplifier.

c. Steps 15 through 32 apply equally to any one of the five output amplifier chassis.

d. All voltage and resistance measurements must be in accordance with the conditions noted in figures 33 through 36. A voltage or resistance indicated as normal refers to the reading on the applicable figure.

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
1. Pilot lamp not lighted; no output from any receiver.	a. Fuse blown.	a. Replace fuse; if it blows again, proceed with step 9.
	b. Power line failure.	b. Check input voltage.
	c. Defective switch.	c. Check switch.
	d. Defective power cord.	d. Check power cord.
	e. Defective cable W401.	e. Check cable W401.
2. Pilot lamp lighted; no output from any receiver.	a. Defective rectifier V201.	a. Replace V201.
	b. Defective part in power supply or filter Z102.	b. Proceed with steps 11 and 13.
	c. Defective tubes in input amplifier chassis.	c. Replace one tube at a time. Return original tube to socket if replacement has no effect.
	d. Defective part in input amplifier chassis.	d. Proceed with steps 33 through 50.
	e. Defective part in main chassis.	e. Proceed with voltage and resistance checks (fig. 34).
	f. Defective filter Z101.	f. Proceed with step 14.
3. One unbalanced input receiver inoperative. Other unbalanced input receiver on same output amplifier chassis normal.	a. Defective output amplifier V301 or V302.	a. If inoperative receiver is connected: (1) To an odd-numbered connector, replace V303 on that chassis. (2) To an even-numbered connector, replace V301 on that chassis.
	b. Defective receiver.	b. Disconnect receiver and connect directly to antenna. If receiver still is inoperative, refer to TM packed with receiver.
	c. Defective coupling capacitor C303 or C306.	c. Check for d-c voltage at output connector. If d-c voltage is present, remove output amplifier chassis and replace capacitor.
4. Both unbalanced input receivers on one output amplifier chassis inoperative, or balanced input receiver on one chassis inoperative.	a. Defective phase inverter V302.	a. Replace V302.
	b. Defective output amplifier tubes V301 and V303.	b. Replace V301 and V303.
	c. Defective part in output amplifier chassis.	c. Proceed with steps 15 through 32 for that particular chassis.
5. Weak signal from all receivers.	a. Defective antenna system.	a. Check installation.
	b. Weak rectifier V201.	b. Replace V201.
	c. Weak tubes in input amplifier chassis.	c. Replace one tube at a time. Return original tube to socket if replacement has no effect.
	d. Incorrect r-f transformer for antenna and operating range.	d. Check label on r-f transformer. Replace transformer if not correct.
	e. Incorrect interstage filter for operating range.	e. Check label on interstage filter. Replace filter if not correct.
6. Weak signal from one receiver only.	a. Defective receiver.	a. Disconnect receiver from output amplifier chassis. Connect receiver to another output amplifier chassis. If operation still is not normal, refer to TM packed with receiver.
	b. Weak tubes in output amplifier chassis.	b. Replace one tube at a time. Return original tube to socket if replacement has no effect.

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
	c. Defective part in output amplifier chassis.	c. Proceed with steps 15 through 32 for that particular chassis.
7. Noisy reception on all receivers.	a. Defective antenna system. b. Antenna connector not tight. c. Intermittent connection in equipment.	a. Check installation. b. Check connector. Tighten if loose. c. Localize by tapping each subchassis lightly. This may require removing one subchassis at a time, and using patch cord (par. 64). If intermittent connection is found, repair connection.
8. Noisy reception on one receiver only.	a. Loose connection from antenna coupler to receiver. b. Intermittent connection in output amplifier chassis. c. Intermittent connection in receiver.	a. Check connections. Tighten if loose. b. Check as in step 7c. c. Check receiver. Refer to receiver TM.
9. Fuse F401 blows.	a. Improper setting of switch S201 for line voltage used. b. Short in power supply chassis. (1) Shorted capacitor C201. (2) Shorted capacitor C202. (3) Shorted winding on transformer T201. c. Short in main chassis. (1) Short in filter Z101 or Z102. (2) One of capacitors C101 through C110 shorted. d. Shorted capacitor C301A.	a. Check setting of S201. If incorrect, set to proper position. b. Disconnect power supply completely. Make resistance checks (par. 66 and fig. 33). (1) If resistance to ground at terminal 1 of L201 is low (below 820,000) replace C201. (2) If resistance to ground at terminal 2 of L201 is low, replace C202. (3) Check resistance across each winding (par. 69). If short is found, replace T201. c. Make resistance checks on main chassis (fig. 34). (1) Resistance at terminals A and C of E103 should be infinite. If a zero reading is obtained, replace defective filter. (2) Check resistance to ground at each capacitor. Replace any defective unit. (a) If resistance to ground at junction of C106 and R101 is near zero, it may be necessary to unsolder C101 through C106 individually to isolate shorted capacitor. (b) A short in one of capacitors C101 through C110 may not cause the fuse to blow; however, such a short will cause eventual burnout of resistors R101 through R105 or line L101, and can ruin the rectifier V201. d. Check resistance at C301A (fig. 35). If resistance is zero replace C301.
10. Hum in output of receivers.	a. Open capacitor C201 or C202.	a. First disconnect C201 and temporarily connect an equivalent capacitor in its place.

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
		If this eliminates the hum, replace C201. If it does not, reconnect C201 and repeat for C202.
	b. Shorted turns in reactor L201.	b. Check resistance of L201. If it is considerably less than 100 ohms, replace L201.
	c. Shorted B+ decoupling filters.	c. If hum is present: (1) In all receivers, shunt, in turn, each of the bypass capacitors in the output amplifier with a .1-uf capacitor. If a defective bypass capacitor is found, replace. (2) In only one receiver, repeat (1) above for the output amplifier chassis to which this receiver is connected. Note. Hum in a particular receiver can be caused by a defect in the receiver filter circuits.
11. No B+ voltage at pin B of connector J203.	a. Defective rectifier V201. b. Open reactor L201. c. Open high-voltage winding on transformer T201.	a. Replace V201. b. Check continuity of L201. Replace if defective. c. Check resistance across terminals 7 and 8, and 8 and 9 (par. 69). If an open winding is found, replace T201.
12. Low voltage at pin B of connector J203.	a. High leakage in capacitor C201 or C202. b. High leakage in capacitors in filter Z102. c. Short in one of bypass capacitors in amplifier chassis.	a. Make resistance checks at C201 and C202. If a low reading is obtained, replace defective capacitor. b. Make resistance check at terminal A of E103. If resistance is low, replace Z102. (1) If resistance at this point is about 1,500 ohms, capacitor C109 or C110 is shorted. (2) If resistance at this point is about 4,700 ohms, one of capacitors C101 through C108 is shorted. c. Make resistance checks at each bypass capacitor in amplifier chassis (figs. 35 and 36).
13. No B+ voltage at terminal A of E103.	Open coil in filter Z102.	Check continuity of Z102. If open, replace unit.
14. No filament voltage at terminal C of E103.	Open coil in filter Z101.	Check continuity of Z101. If open, replace unit.
15. D-c voltage present at connector J302 or J304 (or J303, if in circuit).	Shorted capacitor C303 or C306.	Replace C303 or C306.
16. No voltage at plate (pin 5) of V301.	Open resistor R301 or R302 or shorted capacitor C302.	Check voltage at both ends of R301. a. If voltage is present at B+ end of R301 but not at other end, check resistance at C302. If resistance is zero, replace

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
		C302. If resistance is normal, replace R301. b. If voltage is present at junction of R301 and R302 but not at plate, replace R302.
17. No voltage at plate (pin 5) of V303.	Open resistor R309 or R310 or shorted capacitor C308.	Check voltage at both ends of R309. a. If voltage is present at B+ end of R309 but not at other end, check resistance at C308. If resistance is zero, replace C308. If resistance is normal, replace R309. b. If voltage is present at junction of R309 and R310 but not at plate, replace R310.
18. High voltage at plate (pin 5) of V301.	a. Defective tube V301. b. Open resistor R305.	a. Replace V301. b. Proceed as in step 22a.
19. High voltage at plate (pin 5) of V303.	a. Defective tube V303. b. Open resistor R315.	a. Replace V303. b. Proceed as in step 23.
20. Low voltage at plate (pin 5) of V301.	a. Defective tube V301. b. Shorted capacitor C302A. c. Shorted capacitor C304.	a. Replace V301. b. Proceed as in step 22b. c. Proceed as in step 26.
21. Low voltage at plate (pin 5) of V303.	a. Defective tube V303. b. Shorted capacitor C308C. c. Shorted capacitor C307.	a. Replace V303. b. If resistance is zero replace C308. c. Proceed as in step 27.
22. No voltage at cathode (pin 7) of V301.	a. Open resistor R305. b. Shorted capacitor C302A.	a. Check resistance at cathode. Replace R305 if defective. Caution: A resistance check always must be made if a cathode resistor is suspected. An ordinary voltmeter will act as a resistor, so that a voltage reading can be obtained even with an open cathode resistor. b. If resistance at cathode is zero, replace C302.
23. No voltage at cathode (pin 7) of V303.	Open resistor R315 or shorted capacitor C308C.	Proceed as in step 22.
24. No voltage at screen (pin 6) of V301.	Open resistor R306 or shorted capacitor C302B.	Check voltage at B+ end of R306. If voltage is present, check resistance at screen. a. If resistance is zero, replace C302. b. If resistance is normal but no screen voltage, replace R306.
25. No voltage at screen (pin 6) of V303.	Open resistor R316 or shorted capacitor C308B.	Check voltage at B+ end of R316. If voltage is present, check resistance at screen. a. If resistance is zero, replace C308. b. If resistance is normal but no screen voltage, replace R316.

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
26. Positive voltage present at grid (pin 1) of V301.	Shorted capacitor C304.	Check resistance at C304. If resistance is about 27,000 ohms on both sides, replace C304. Note. If this check is inconclusive, disconnect C304. If positive voltage disappears from grid, replace C304.
27. Positive voltage present at grid (pin 1) of V303.	Shorted capacitor C307.	Check resistance at C307. If resistance is about 27,000 ohms on both sides, replace C307. Note. If this check is inconclusive, disconnect C307. If positive voltage disappears from grid, replace C307.
28. No voltage at plate (pin 5) of V302.	Open resistor R307 or R308 or shorted capacitor C301B.	Check voltage at each end of R308. a. If voltage is present at B+ end of R308 but not at other end, check resistance at C301B. If resistance is zero, replace C301. If resistance is normal, replace R308. b. If voltage is present at junction of R307 and R308 but not at plate replace R307.
29. High voltage at plate (pin 5) of V302.	a. Defective tube V302. b. Open resistor R313.	a. Replace V302. b. Proceed as in step 31.
30. Low voltage at plate (pin 5) of V302.	a. Defective tube V302. b. Shorted capacitor C305.	a. Replace V302. b. Proceed as in step 32.
31. No voltage at cathode (pin 7) of V302.	Open resistor R313.	Check resistance at cathode, Replace R313 if open.
32. Positive voltage present at grid (pin 6) of V302.	Shorted capacitor C305.	Disconnect C305. If positive voltage disappears from grid, replace C305.
33. No voltage at plate (pin 5) of V3.	Open circuit in main chassis components.	Check voltages on main chassis (fig. 34).
34. High voltage at plate (pin 5) of V3.	a. Defective tube V3. b. Open resistor R10.	a. Replace V3. b. Proceed as in step 36a.
35. Low voltage at plate (pin 5) of V3.	a. Defective tube V3. b. Shorted capacitor C5B. c. Shorted capacitor C2.	a. Replace V3. b. Proceed as in step 36b. c. Proceed as in step 37.
36. No voltage at cathode (pin 7) of V3.	a. Open resistor R10. b. Shorted capacitor C5B.	a. Check resistance at cathode. Replace R10 if open. b. If resistance at cathode is zero, replace C5.
37. Positive voltage present at grid (pin 1) of V3.	Shorted capacitor C2.	Disconnect C2. If positive voltage disappears, replace C2.
38. No voltage at plate (pin 1) of V2.	a. Open resistor R12	a. Check voltage at each end of R12.

67. Trouble-shooting Chart (contd)

Symptom	Probable Trouble	Correction
	or shorted capacitor C5A.	If voltage is present at B+ end but not at other, make resistance check at pin 4 of J4. (1) If resistance is zero, replace C5. (2) If resistance is normal, replace R12.
	b. Open circuit in interstage filter.	b. Check voltages at pins 1 and 4 of J4. If voltage is present at pin 4 but not at pin 1, replace filter.
39. High voltage at plate (pin 1) of V2.	a. Defective tube V2. b. Open resistor R14.	a. Replace V2. b. Proceed as in step 41a.
40. Low voltage at plate (pin 1) of V2.	a. Defective tube V2. b. Shorted capacitor C4A. c. Shorted capacitor C3.	a. Replace V2. b. Proceed as in step 41b. c. Proceed as in step 42.
41. No voltage at cathode (pin 7) of V2.	a. Open resistor R14. b. Shorted capacitor C4A.	a. Check resistance at cathode. Replace R14 if open. b. If resistance at cathode is zero, replace C4.
42. Positive voltage present at grid (pin 6) of V2.	Shorted capacitor C3.	Disconnect C3. If positive voltage disappears, replace C3.
43. No voltage at plate (pin 2) of V2.	a. Open resistor R2, R8, R15, or R16; open coil L2. b. Shorted capacitor C4B.	a. Check voltage at each point. If voltage is present at B+ side of part but not at other, replace part. b. Check resistance at C4B. If zero, replace C4.
44. High voltage at plate (pin 2) of V2.	a. Defective tube V2. b. Open resistor R14.	a. Replace V2. b. Proceed as in step 41a.
45. Low voltage at plate (pin 2) of V2.	a. Defective tube V2. b. Shorted capacitor C4A. c. Shorted capacitor C1.	a. Replace V2. b. Proceed as in step 41b. c. Proceed as in step 46.
46. Positive voltage present at grid (pin 5) of V2.	Shorted capacitor C1.	Disconnect C1. If positive voltage disappears, replace C1.
47. No voltage at plate (pin 1) of V1.	a. Open resistor R1 or R3 or coil L1. b. Shorted capacitor C4B.	a. Check voltage at each point. Replace defective part. b. Proceed as in step 43b.
48. High voltage at plate (pin 1) of V1.	a. Defective tube V1. b. Open resistor R13.	a. Replace V1. b. Proceed as in step 50a.
49. Low voltage at plate (pin 1) of V1.	a. Defective tube V1. b. Shorted capacitor C4C.	a. Replace V1. b. Proceed as in step 50b.
50. No voltage at cathode (pin 7) of V1.	a. Open resistor R13. b. Shorted capacitor C4C.	a. Check resistance at cathode. Replace R13 if open. b. If resistance at cathode is zero, replace C4C.

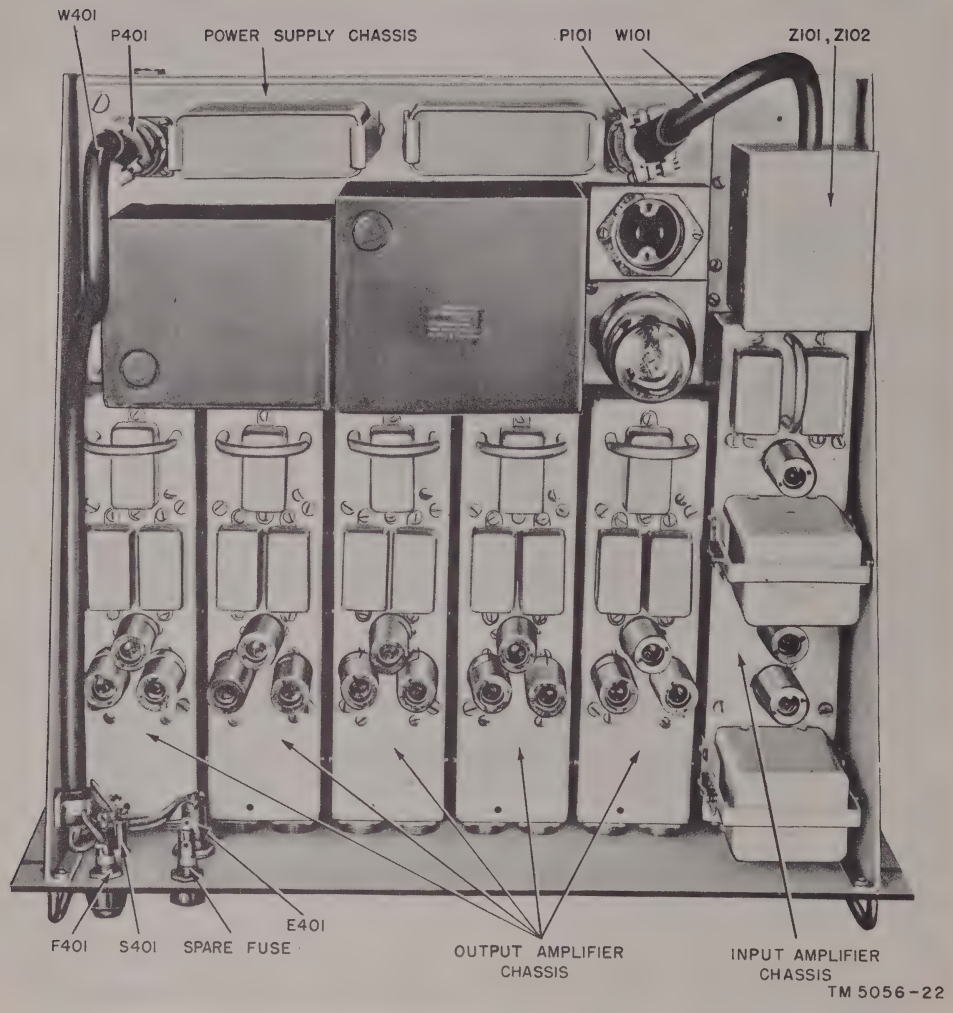


Figure 22. Antenna Coupler CU-52/URR, top view.

68. Signal Substitution

The signal substitution procedures outlined in this paragraph are intended to supplement the trouble-shooting chart and will aid in localizing the trouble to a particular stage. The tests require the use of a receiver and a signal generator (par. 73).

a. PRELIMINARY STEPS.

(1) The power supply circuits must be operating properly, as determined by the voltage and resistance measurements.

(2) Make use of the patch cords (par. 64) to allow tests to be made beneath the subchassis.

b. PROCEDURE.

(1) Connect the receiver to the output amplifier chassis which is suspected of being defective.

(2) Set the signal generator to the proper frequency as determined by the r-f transformers and filters used. The signal generator modulation must be on.

(3) Feed the signal generator output first to the grid (pin 1) of V301 and then to the grid (pin 1) of V303. If no output or weak output is obtained in either case, replace V301 or V303. If replacement has no effect, make voltage and resistance checks.

(4) Feed the signal generator output to the grid (pin 6) of V302. If zero or weak output is obtained, replace V302. If replacement is not effective, make voltage and resistance checks.

(5) Proceed in the same manner for each of the other four output amplifier chassis, if required.

(6) Feed the output of the signal generator to the grid (pin 1) of V3. If zero or weak output is obtained, replace V3. If replacement has no effect, make voltage and resistance checks in that stage, and also check artificial transmission line L101.

(7) Feed the output of the signal generator to the grid (pin 6) of V2. If zero or weak output is obtained, replace V2. If replacement has no effect, make voltage and resistance checks.

Note. The frequency of the signal generator must be within the band pass of the filter used.

(8) Feed the output of the signal generator to the grid (pin 5) of V2. If zero or weak output is obtained, replace V2. If replacement has no effect, make voltage and resistance checks.

(9) Feed the output of the signal generator to the grid (pin 6) of V1. If zero or weak output is obtained, replace V1. If replacement has no effect, make voltage and resistance checks.

(10) Install r-f transformer Z24 in the input amplifier chassis. Connect the signal generator output to the UNBAL INPUT connector J1 as shown in A, figure 38. If normal output is obtained from the receiver, the trouble is in the r-f transformer which was removed.

Note. Absolute checks of the r-f transformers are described in section III of this chapter.

69. D-c Resistances of Transformer and Coils

The d-c resistances of the power transformer windings, the filter reactor, the noise filters, and the peaking coils are listed in the following table:

Component	Terminals	Ohms
L1		.15
L2		.15
L101		.6
Z101	1- 2	.05
Z102	1- 2	.7
T201	1- 2 3- 4 5- 6 7- 8 8- 9 10-11	2.6 2.6 .05 35 35 .1
L201	1- 2	100
L301		.3
L302		.3

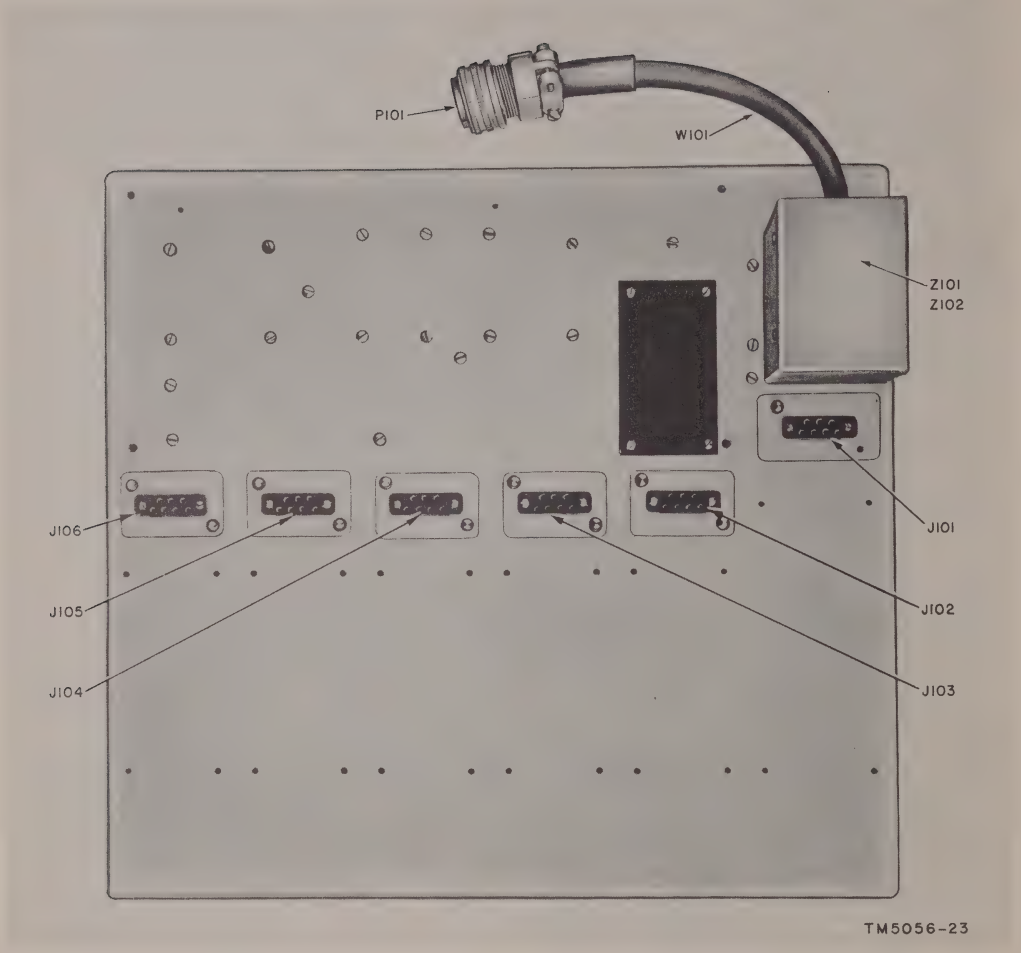


Figure 23. Main chassis, top view.

70. Stage Gain Measurements

The following stage gain measurements supplement the trouble-shooting information outlined in the preceding paragraphs. Use the charts as standards to check the gain of each stage in the antenna coupler. When the overall sensitivity appears to be low, check the tubes in the input amplifier chassis. If the tubes are satisfactory, check the gain of each stage in the input amplifier chassis. If the output of one output amplifier chassis is low, check the tubes in that chassis. If the tubes are satisfactory, check the gain of each stage in the particular output amplifier chassis.

Note. The stage gain values shown in the charts are subject to variation, due to differences in tubes, line voltage, etc.

a. INPUT AMPLIFIER CHASSIS. Proceed as follows to check the stage gain of the input amplifier chassis:

(1) Remove the input amplifier chassis from the main chassis.
(2) Connect the input amplifier chassis to the main chassis by means of a patch cord.
(3) Install r-f transformer Z24 and interstage filter Z4.
(4) Connect the output of the signal generator to the UNBAL INPUT connector.
(5) Connect the ground lead of the r-f voltmeter to the input amplifier chassis.
(6) Set the frequency of the signal generator in accordance with the chart below, with no modulation.
(7) Set the ouptut of the signal generator to obtain 100,000 microvolts (0.1 volt) at the grid (pin 6) of V1; maintain this setting throughout the input amplifier chassis stage gain measurements.
(8) Proceed with the measurements as shown in the following chart. Use a .01 uf, 500-volt mica capacitor between the "high" side of the r-f voltmeter and the point of measurement. To determine the gain for each stage, divide the r-f voltage at the plate of that stage by the r-f voltage at the plate of the preceding stage. (The gain of V1 is obtained by dividing the r-f voltage at the plate (pin 1) of V1 by the r-f voltage at the grid (pin 6) of V1.)

Stage	R-F voltmeter connection	Gain	
		0.1 mc	24 mc
V1	V1, pin 6	- -	- -
	V1, pin 1	4.1	1.3
V2A	V2, pin 2	2.3	1.9
V2B	V2, pin 1	1.7	3.6
V3	V3, pin 5	0.43	0.21

b. OUTPUT AMPLIFIER CHASSIS. Proceed as follows to check the stage gain of each output amplifier chassis:

(1) Remove the particular output amplifier chassis from the main chassis.
(2) Connect the output amplifier chassis to the main chassis by means of a patch cord.
(3) Connect the output of the signal generator to the grid (pin 6) of V302.
(4) Connect a 270-ohm resistor from connector J302 to ground, and connect a 270-ohm resistor from connector J304 to ground.

Note. If the output amplifier chassis connections have been altered for balanced receiver operation (par. 15) connect a 270-ohm resistor from each terminal of connector J303 to ground.

(5) Connect the ground lead of the r-f voltmeter to the input amplifier chassis.
(6) Set the frequency of the signal generator in accordance with the chart

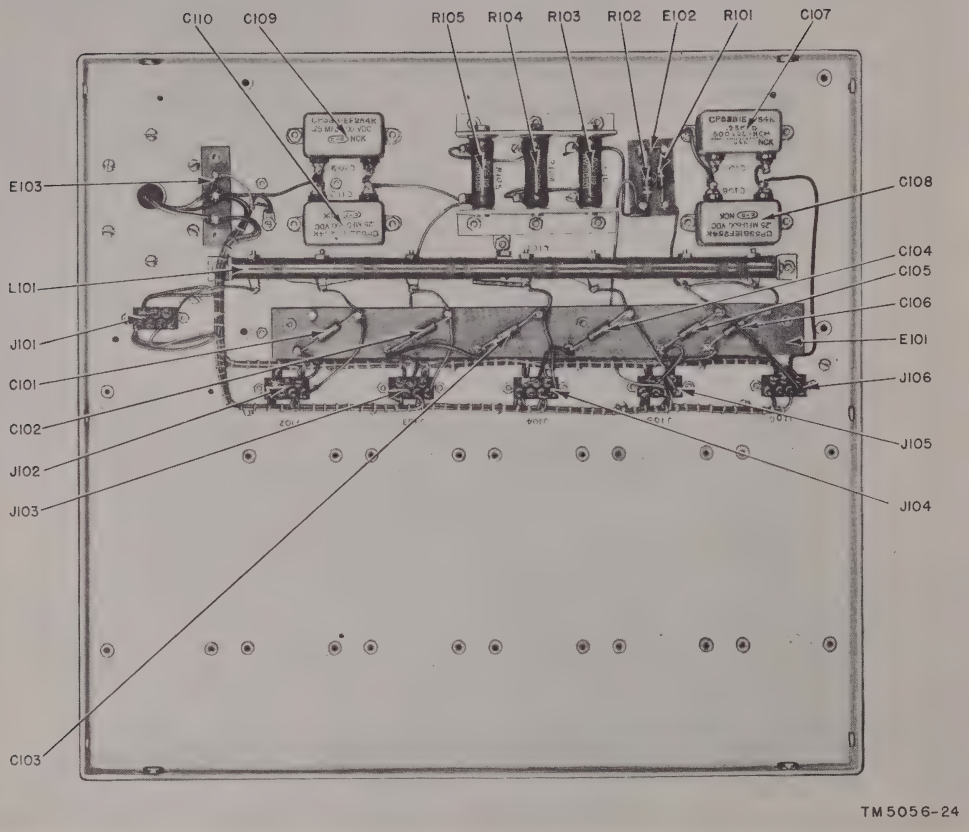


Figure 24. Main chassis, bottom view.

below, with no modulation.

(7) Set the output of the signal generator to obtain 500,000 microvolts (0.5 volt) at the grid (pin 6) of V302. Maintain this setting throughout the output amplifier chassis stage gain measurements.

(8) Proceed with the measurements as shown in the following chart. Use a .01 uf, 500-volt mica capacitor between the "high" side of the r-f voltmeter and the point of measurement. To determine the gain for each stage, divide the r-f voltage at the plate of that stage by the r-f voltage at the plate of the preceding stage. (To determine the gain of V302, divide the r-f voltage at the plate (pin 5) of V302 by the r-f voltage at the grid (pin 6) of V302.)

Stage	R-F voltmeter connection	Gain	
		0.1 mc	24 mc
V302	V302, pin 6	- -	- -
	V302, pin 5	0.60	0.65
	V302, pin 7	0.55	0.85
V301	V301, pin 5	0.83	0.92
V303	V303, pin 5	0.68	0.88

Section II. REPAIRS

71. Replacement of Parts

Most of the parts in Antenna Coupler CU-52/URR are readily accessible and are easily replaced if found to be faulty. The only units requiring any amount of disassembly for replacement purposes are filters Z101 and Z102. Proceed as follows:

a. Unsolder the wires entering the shield can. Tag the wires.

b. Remove the screws holding the cover in place and lift off the cover.

c. Unsolder the cable wires connecting to the filter terminals. Tag the wires.

d. Remove the filter mounting screws and lift out the filters.

e. When replacing the filters, reverse the procedures, of subparagraphs a through d above.

72. Refinishing

Instructions for refinishing badly marred panels on exterior cabinets are given in TM 9-2851.

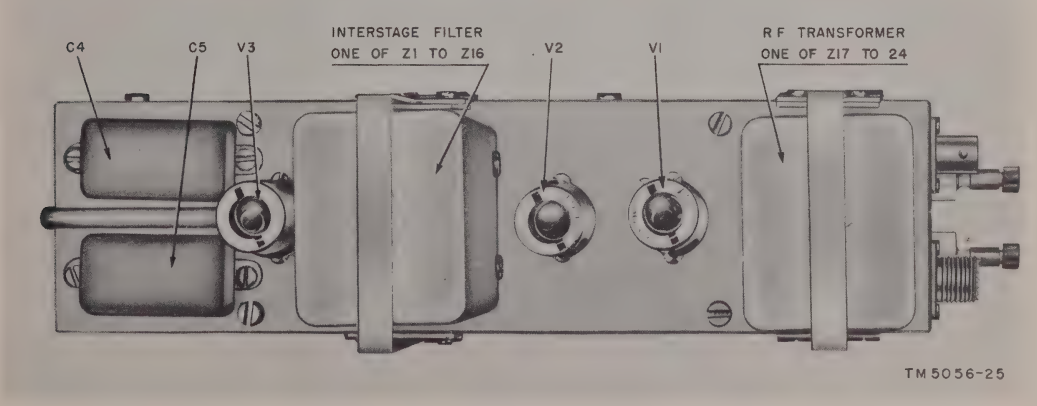


Figure 25. Input amplifier chassis, top view.

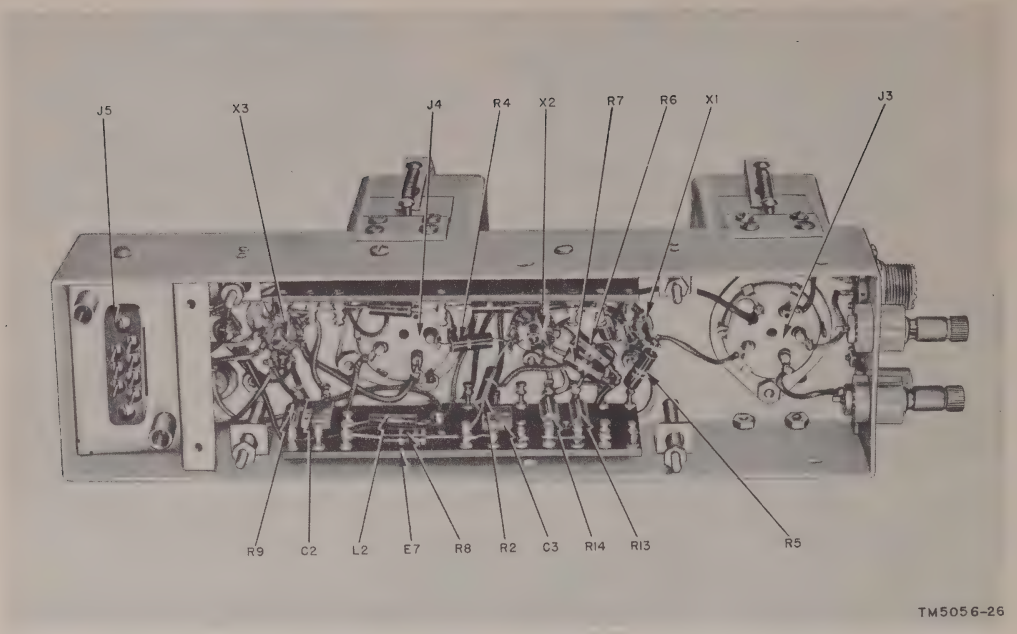


Figure 26. Input amplifier chassis, bottom view.

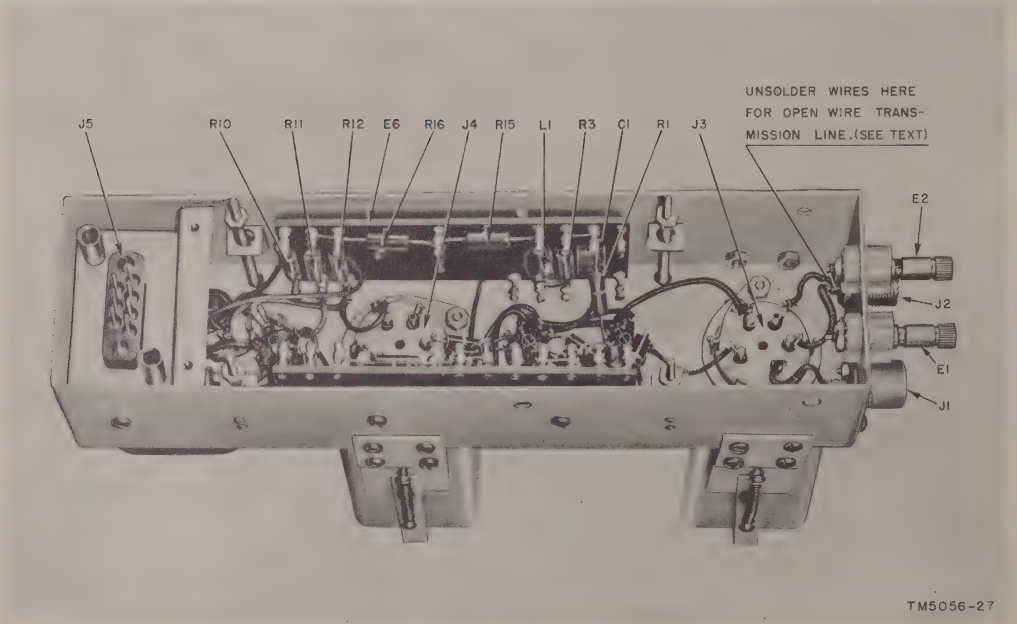


Figure 27. Input amplifier chassis, bottom view.

Section III. FINAL TESTING

73. General

This section is intended as a guide to be used in determining the quality of a repaired Antenna Coupler CU-52/URR. The minimum test requirements outlined in the following paragraphs may be performed by maintenance personnel with adequate test equipment and the necessary skills. Repaired equipment meeting these requirements will furnish uniformly satisfactory operation.

74. Test Equipment

a. The test equipment required for performing the tests outlined in this section is listed in the following table:

Test equipment	Technical literature
Electronic Multimeter TS-505/U	TM 11-5511
Radio Receiver R-211A/U	TM 11-487A
Signal Generator TS-588/U	TM 11-5018 IB

b. In addition to the equipment listed, a screened test cage should be available to avoid interference from external signals. The following components are required also, as shown in figure 38:

Quantity	Component	Value	Description
1	Resistor	50 ohms	
2	Resistor	50 ohms - R*	
4	Resistor	100 ohms	
1	Resistor	100 ohms - R*	
2	Resistor	200 ohms - R*	
1	Resistor	300 ohms	
1	Resistor	300 ohms - R*	
1	Resistor	600 ohms	
2	Capacitor	.05 uf	600 volts, paper dielectric
2	R-f choke	100 uh	3-ampere rating
2	Plug connector		UG-421/U
4	Plug connector		UG-573/U
	Radio Frequency Cable		RG-8/U
	Radio Frequency Cable		RG-22/U

*R is output impedance of signal generator.

Notes:
1. All resistors are noninductive type.
2. Although several of the components can be used in more than one set-up, it is advisable to prepare a separate test set-up for each check. The quantities listed above are determined on this basis.

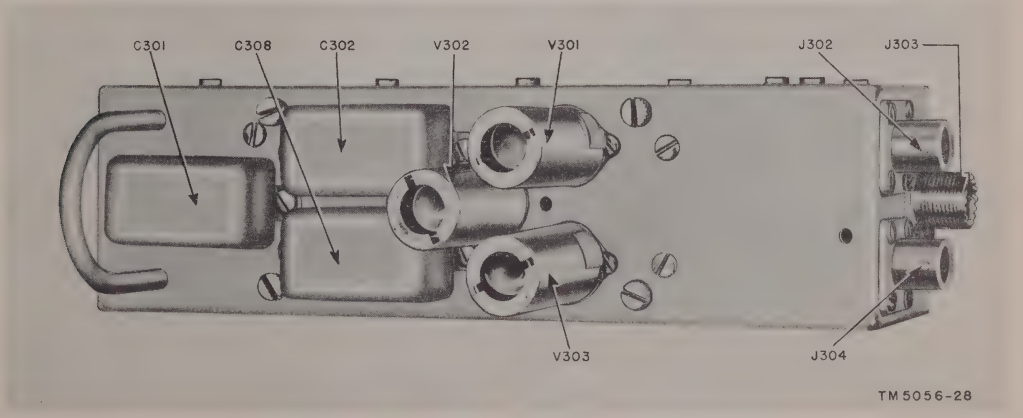


Figure 28. Output amplifier chassis, top view.

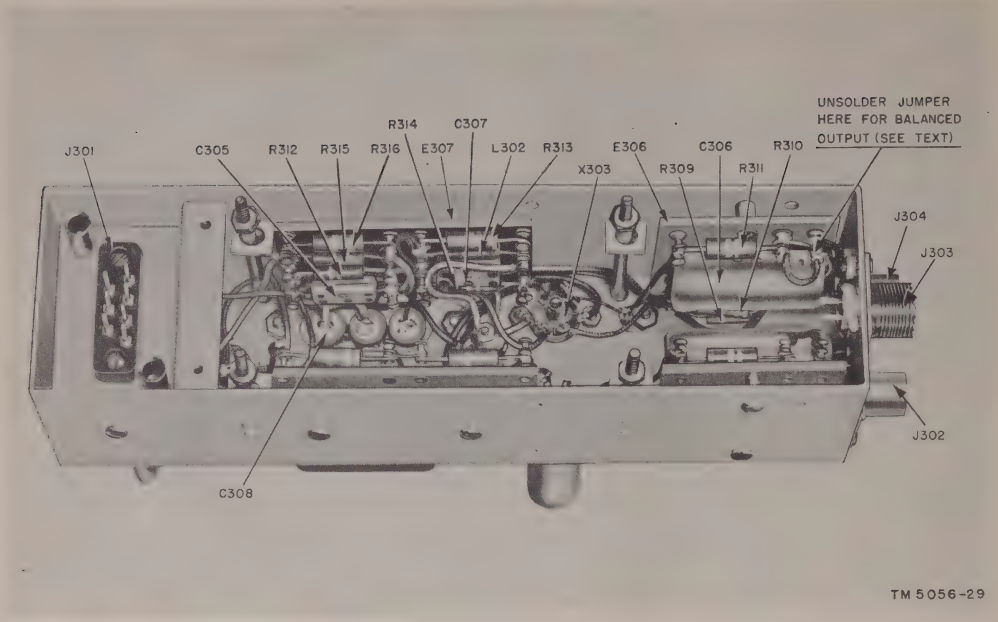


Figure 29. Output amplifier chassis, bottom view.

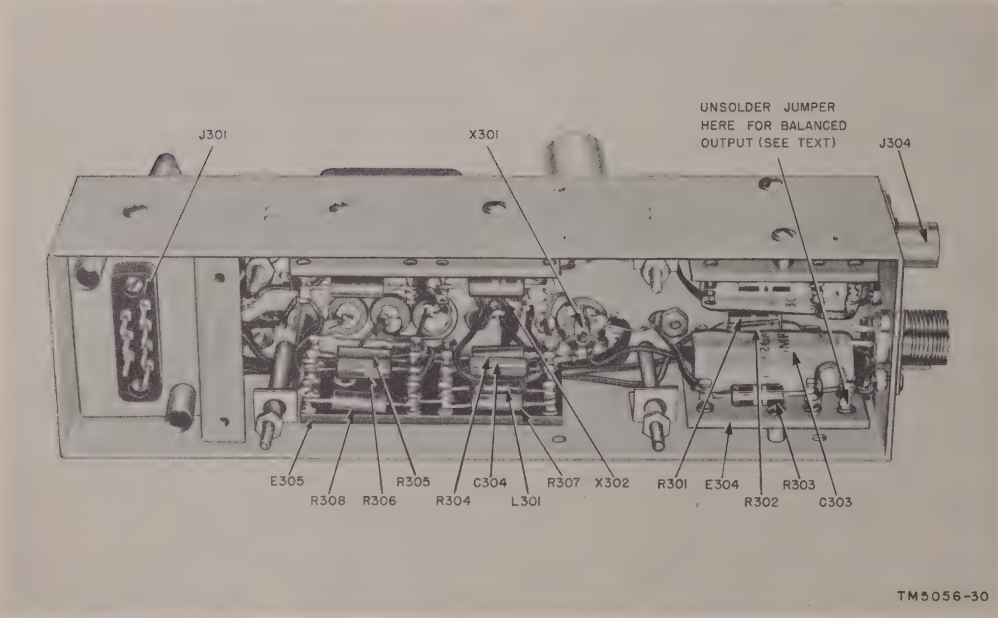


Figure 30. Output amplifier chassis, bottom view.

75. Test Conditions

a. Conduct all tests in a screened test cage.

b. Line voltage should be 115 volts.

c. R-f transformer installed is Z24.

d. Interstage filter installed is Z4.

76. Sensitivity Check
(A, fig. 38)

Proceed as follows to check the over-all sensitivity of Antenna Coupler CU-52/URR.

a. Install r-f transformer Z24 and interstage filter Z4 in the input amplifier chassis.

b. Connect the output of the signal generator to the UNBAL INPUT (No. 2) connector. Use the terminating resistors as shown.

c. Connect the output of the antenna coupler to the antenna input on the receiver, using r-f cable. For the first test, connect the receiver to the UNBALANCED OUTPUT (No. 1) connector on the antenna coupler.

d. Connect the a-f (audio-frequency) output of the receiver to the output meter.

e. Set the receiver AVC switch to OFF.

f. Set the receiver LIMITER switch to OFF.

g. Set the receiver SELECTIVITY switch to OFF.

h. Set the frequency of the signal generator to .1 mc.

i. Tune the receiver to .1 mc.

j. Set the r-f output of the signal generator at approximately 10 microvolts.

k. Set the signal generator modulation switch to ON and adjust it for 30 percent modulation at 400 cycles.

l. Adjust the SENSITIVITY control on the receiver for a reading of 10 mw (milliwatt) on the output meter.

m. Turn off the signal generator modulation. Observe the reading on the output meter.

n. If the output meter indicates more than 2-1/2 mw, increase the output of the signal generator, and repeat subparagraphs k through m above. If the output meter indicates less than 2-1/2 mw, decrease the output of the signal generator, and repeat subparagraphs k through m above.

o. Repeat subparagraphs k through m above until the output meter indicates 10 mw with modulation and 2-1/2 mw without modulation.

p. Note the r-f voltage output of the signal generator. This output is the over-all sensitivity of the antenna coupler in microvolts for the output channel tested.

q. Disconnect the receiver from the number 1 connector, and connect it to the num-2 connector.

r. Repeat subparagraphs j through p above.

s. Repeat subparagraphs j through p above for the remaining output channels.

t. Set the signal generator at 12 mc, and tune the receiver to 12 mc.

u. Repeat subparagraphs j through p above for each output channel.

v. Set the signal generator at 24 mc, and tune the receiver to 24 mc.

w. Repeat subparagraphs j through p above for each output channel.

x. The over-all sensitivity for each output channel should not be greater than that listed in the following chart for each frequency.

Frequency, mc	Sensitivity, microvolts
.1	2
12	2
24	2

77. Isolation Check
(A, fig. 38)

The purpose of this check is to test the isolation between output channels. Isolation must be checked between connectors on the same output amplifier chassis (electrical isolation) and between each connector on one chassis and the nearest connector on the adjacent chassis (mechanical isolation).

Note. As the test set-up for the isolation check is identical to that for the sensitivity check (A, fig. 38), the two checks may be made concurrently, if desired.

a. Proceed as in subparagraphs a through o in paragraph 76. Note the output of the signal generator.

b. Without changing the receiver settings, disconnect the signal generator from the UNBAL INPUT connector, and connect it to the UNBALANCED OUTPUT connector (number 2).

c. Readjust the signal generator output to obtain 2-1/2 mw without modulation and 10 mw with modulation. Note the output of the signal generator.

d. The ratio of the output of the signal generator in subparagraph c above to that noted in subparagraph a above is the isolation

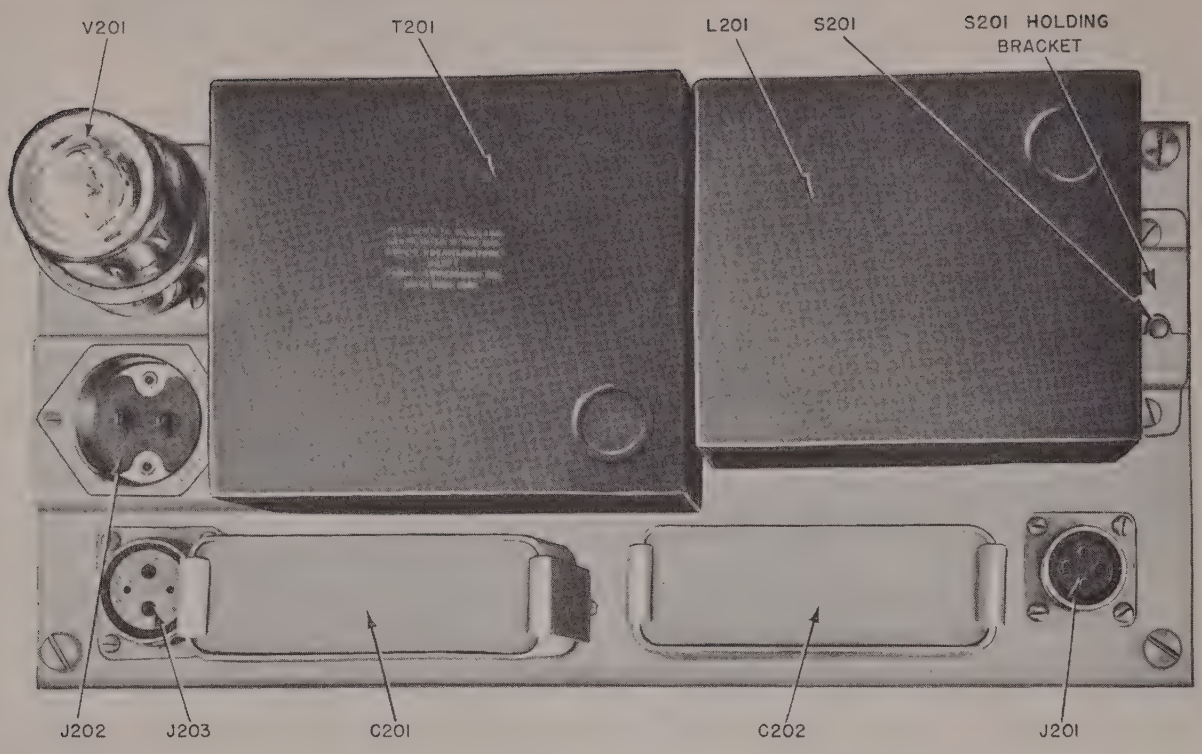


Figure 31. Power supply chassis, top view.

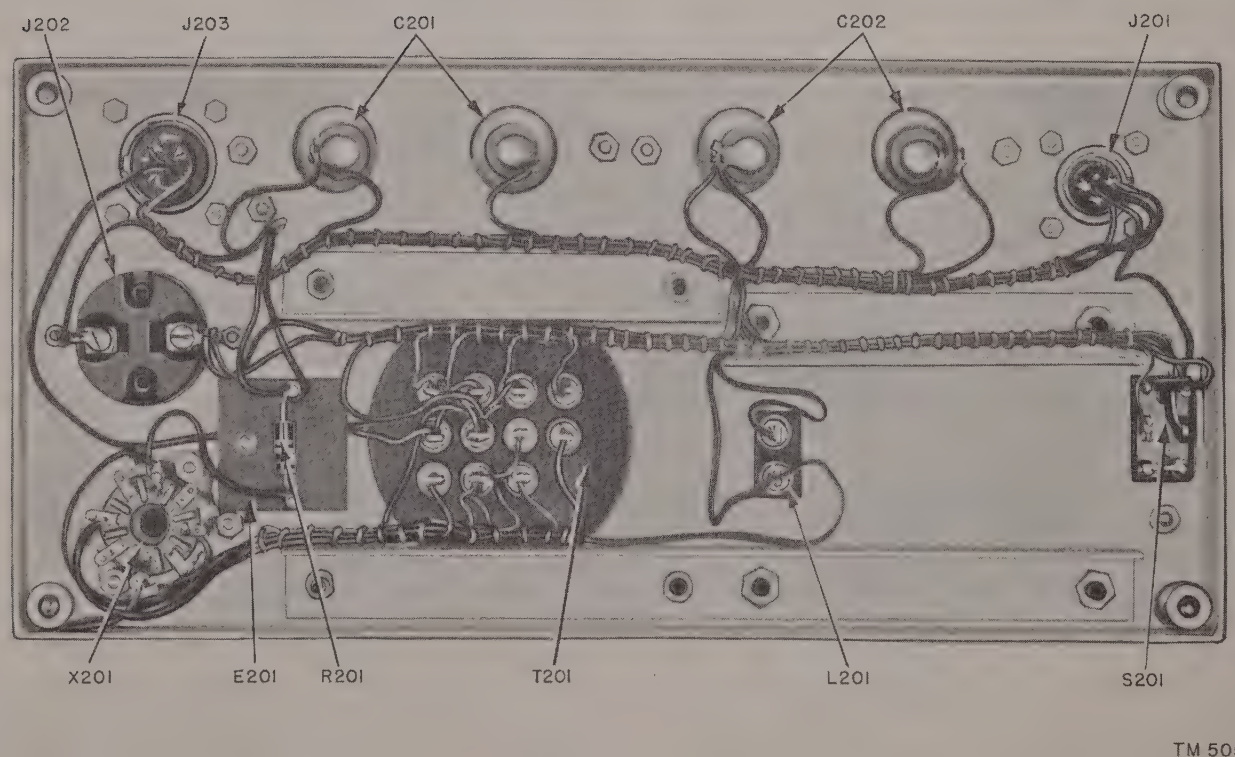


Figure 32. Power supply chassis, bottom view.

ratio for the two adjacent channels checked.

e. Repeat the above procedures for frequencies of 12 mc and 24 mc, and for each electrically adjacent and mechanically adjacent channel.

f. The isolation ratio should not be less than that listed in the following table for each frequency:

Frequency, mc	Isolation ratio	
	Ratio	db
.1	32,000:1	90
12.	32,000:1	90
24.	32,000:1	90

78. Intermodulation Threshold Check (E, fig. 38)

The purpose of this check is to determine that the amplifier tubes are operating correctly on the linear portion of the characteristic curves. If the tubes operate on the nonlinear portion of the curves, mixing action will occur, and the sum and difference frequencies produced will cause undesirable interference. Proceed as follows:

a. Install r-f transformer Z24 and interstage filter Z4 in the input amplifier chassis.

b. Connect the two signal generators to the UNBAL INPUT (number 2) connector as shown.

c. Connect the receiver and output meter as shown.

d. Set one signal generator to 8 mc, modulated 30 percent at 400 cycles.

e. Set the second signal generator to 6 mc, unmodulated.

f. Tune the receiver to the difference between the two signal generator frequencies (2 mc).

g. Adjust the output of both generators (maintaining equal output from each generator) and the receiver sensitivity control until the output meter indicates 2-1/2 mw without modulation and 10 mw with modulation (on the first signal generator only).

h. Note the signal generator output. (The output should be the same on both generators.) The input to the antenna coupler is one-half the indicated signal generator output.

i. Repeat subparagraphs d and e above.

j. Tune the receiver to the sum of the two signal generator frequencies (14 mc).

k. Repeat subparagraphs g and h above.

l. The lowest value recorded in subparagraphs h and k above is the intermodulation threshold measurement for output channel number 1.

m. Connect the receiver in turn to channels 2 through 10, proceeding as in subparagraphs d through l above for each channel.

n. For any of the output channels, the intermodulation threshold should be not less then 1,000 microvolts, that is, 2,000 microvolts signal generator indicated output.

79. Power Line Filtering Check (F, fig. 38)

The purpose of this test is to check the adequacy of filtering and shielding within the antenna coupler against r-f signals and noise which may be present on the power line. Proceed as follows:

a. Install r-f transformer Z24 and interstage filter Z4.

b. Connect the signal generator output to the power line as shown.

c. Connect the a-c input cable of the antenna coupler to the power line at the junction of the chokes and capacitors as shown.

d. Connect the receiver to output channel number 1, and connect the a-f output of the receiver to the output meter.

e. Set the frequency of the signal generator to .1 mc.

f. Tune the receiver to .1 mc.

g. Adjust the signal generator output and the receiver sensitivity control to obtain 2-1/2 mw on the output meter with no modulation, and 10 mw on the output meter with 30 percent modulation at 400 cycles.

h. Note the generator output. The ratio of this output and the output of the signal generator for the sensitivity test (par. 76) is the attenuation of the path from the power line to the output channel.

i. Repeat subparagraphs e through h above for frequencies of 12 and 24 mc.

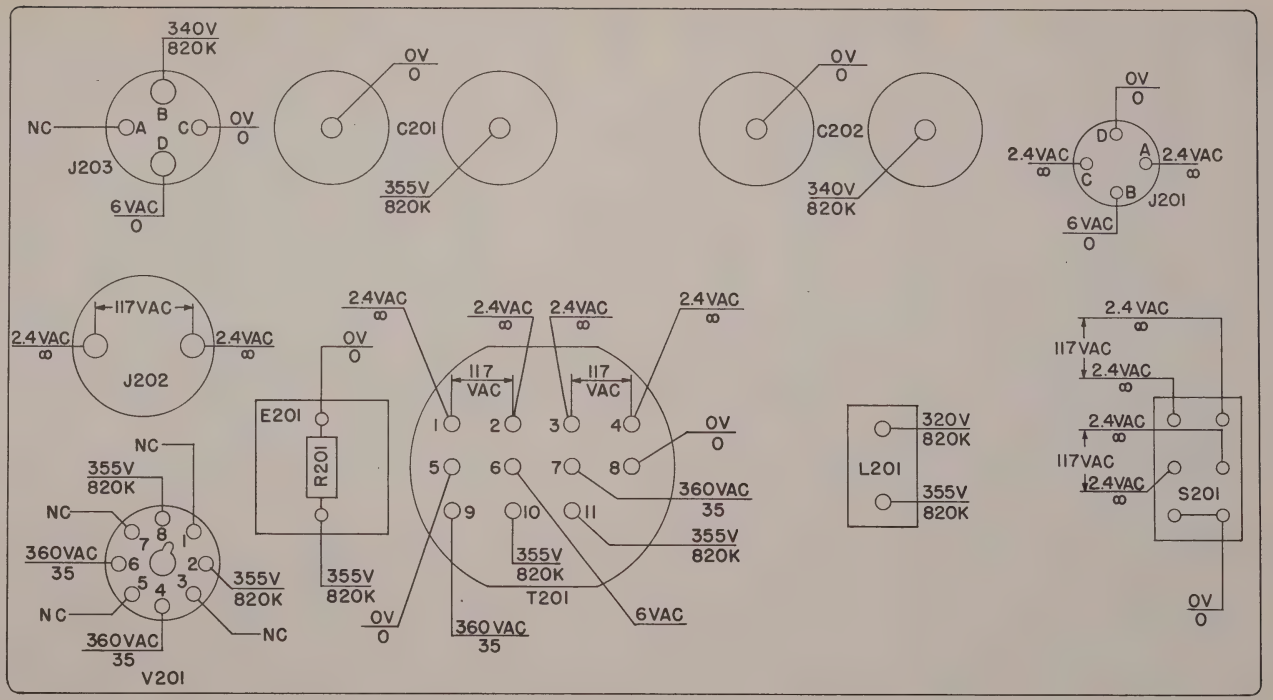
j. The attenuation for each frequency shall be at least 80 db (decibel) (10,000 to one).

80. R-F Transformer Check (B, C, D, fig. 38)

Proceed as described in this paragraph to test r-f transformers Z17 through Z24.

a. UNBALANCED TRANSFORMERS.

(1) Connect the equipment as shown in B, figure 38. The input amplifier



NOTES

1 ALL MEASUREMENTS OBTAINED WITH VACUUM TUBE VOLTMETER.
2 ALL MEASUREMENTS TO GROUND (CHASSIS) , UNLESS OTHERWISE NOTED.
3 POWER INPUT 117 VOLTS A.C.
4 SWITCH S201 IN "115V" POSITION.
5 ALL VOLTAGES D.C. UNLESS OTHERWISE NOTED.
6 VOLTAGE MEASUREMENTS OBTAINED WITH ALL UNITS CONNECTED AND OPERATING.
7 RESISTANCE MEASUREMENTS OBTAINED WITH POWER SUPPLY CHASSIS REMOVED FROM MAIN CHASSIS. NO EXTERNAL CONNECTIONS.
8 RESISTANCE MEASUREMENTS ABOVE 3 MEGOHMS INDICATED AS INFINITY (∞)
9 NC INDICATES NO CONNECTION.

TM 5056-33

Figure 33. Power supply chassis, voltage and resistance diagram.

chassis must be removed from the main chassis and connected by means of a patch cord (par. 64) to permit connecting the electronic voltmeter to the grid of V1.

(2) Install r-f transformer Z17 and interstage filter Z4.

(3) Set the frequency of the signal generator at .1 mc.

(4) Set the output of the signal generator at 500,000 microvolts (.5 volts).

(5) Observe the reading on the electronic voltmeter. The ratio of this reading to the output of the signal generator is the gain of r-f transformer Z17.

(6) Repeat subparagraphs (4) and (5) above for frequencies of 1.6 and 3.5 mc.

(7) Repeat subparagraphs (1) through (5) above with transformer Z18 installed, for frequencies of 2.4, 12, and 24 mc.

(8) The gain of r-f transformer Z17 over the range of .1 through 3.5 mc, and r-f transformer Z18 over the range of 2.4 through 24 mc, must be not less than unity for each frequency.

b. BALANCED TRANSFORMERS.

(1) Connect the equipment as shown in C, figure 38.

(2) Install r-f transformer Z19 and interstage filter Z4.

(3) Set the frequency of the signal generator at .1 mc.

(4) Set the output of the signal generator at 500,000 microvolts (.5 volts).

(5) Observe the reading on the electronic voltmeter. The ratio of the reading on the electronic voltmeter to the signal generator output is the gain of r-f transformer Z19.

(6) Repeat subparagraphs (4) and (5) above for frequencies of 1.6 and 3.5 mc.

(7) Repeat subparagraphs (1) through (5) above with transformer Z20 installed for frequencies of 2.4, 12, and 24 mc.

(8) The gain of r-f transformer Z19 over the range of .1 to 3.5 mc, and r-f transformer Z20 over the range of 2.4 through 24 mc, must be not less than unity for each range.

(9) Connect the equipment as shown in D, figure 38.

(10) Install r-f transformer Z21 and check the gain at frequencies of .1, 1.6, and 3.5 mc.

(11) Install r-f transformer Z22, and check the gain of frequencies of 2.4, 12, and 24 mc.

(12) The gain of transformers Z21 and Z22 shall be not less than .5 for the frequencies checked.

81. Interstage Filter Check (A, fig. 38)

The purpose of these checks is to determine the band-pass characteristic of each interstage filter. The checks must be performed by skilled personnel, using precision test equipment. In order to obtain minimum performance data, it will be necessary to check the particular filters against filters which are known to have the correct frequency response. Proceed as follows:

a. Connect the equipment as shown in A, figure 38.

b. Install r-f transformer Z24.

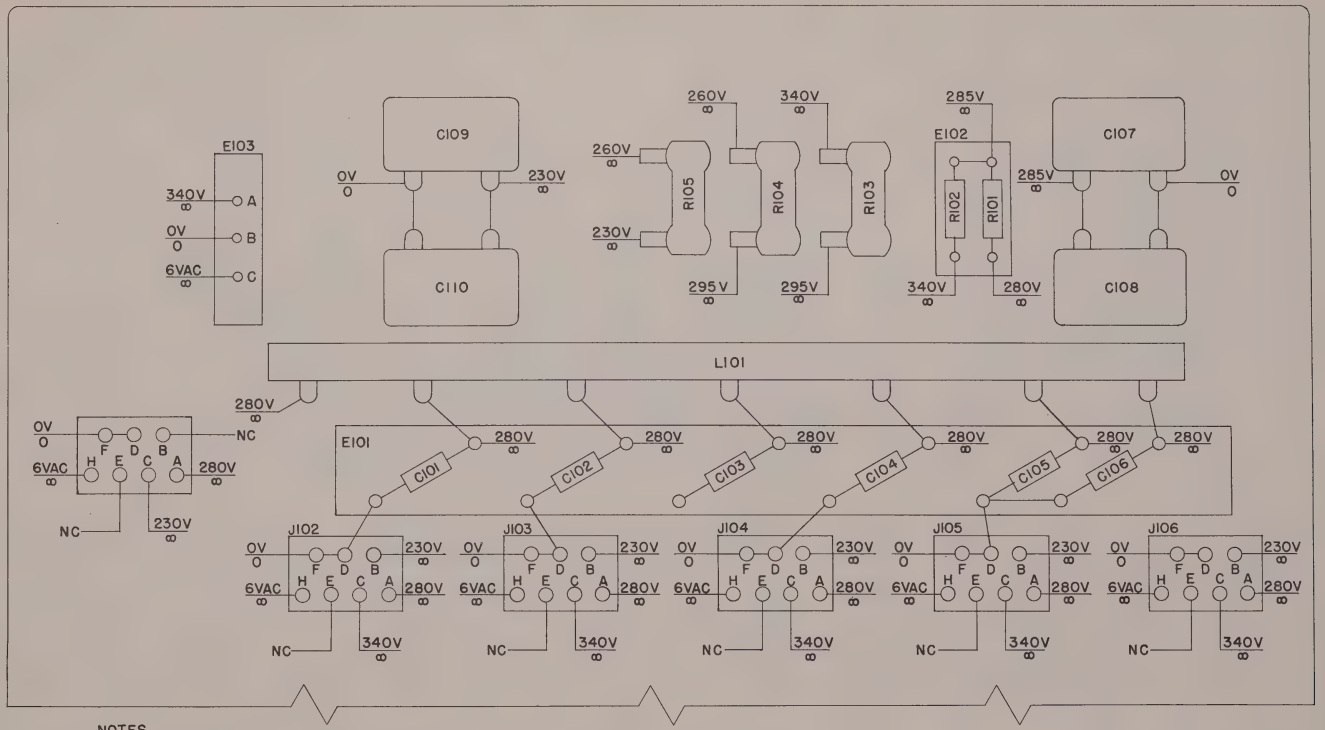
c. Install interstage filter Z1.

d. Proceed as described for the sensitivity check (par. 76) over the frequency range of .1 to 1.6 mc.

e. Remove Z1, and install an equivalent filter Z1 which is known to be operating correctly.

f. The gain obtained at each frequency in subparagraph d above must be equal to or better than the gain obtained in step e for each frequency checked.

g. Repeat subparagraphs c through f above for each of interstage filters Z2 through Z16, in each case, checking the gain against that of an equivalent standard.

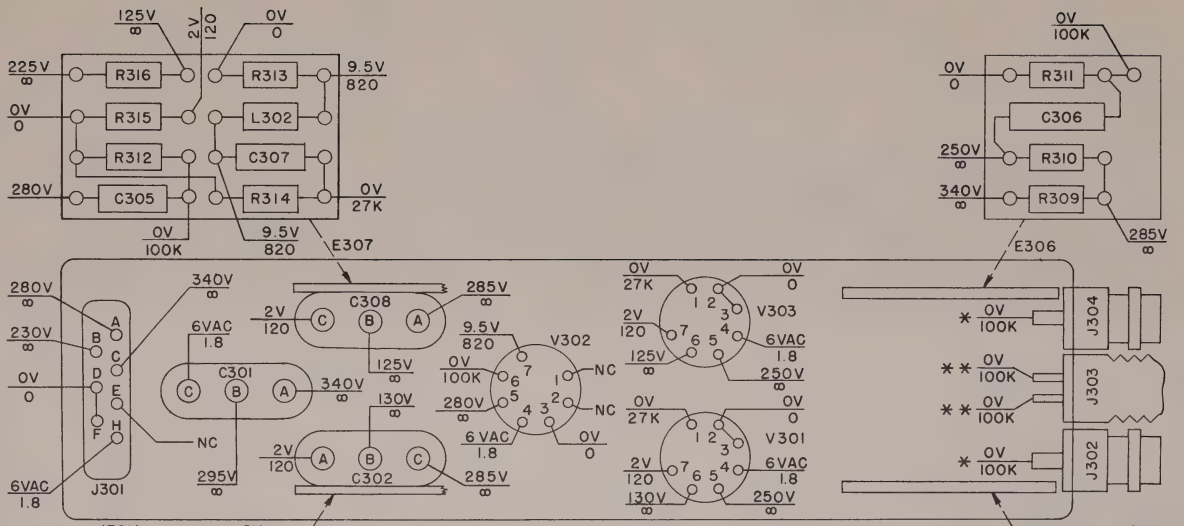


NOTES

1. ALL MEASUREMENTS OBTAINED WITH VACUUM TUBE VOLTMETER.
2. ALL MEASUREMENTS TO GROUND (CHASSIS).
3. ALL VOLTAGES D.C. UNLESS OTHERWISE NOTED.
4. VOLTAGE MEASUREMENTS OBTAINED WITH ALL UNITS CONNECTED AND OPERATING.
5. RESISTANCE MEASUREMENTS OBTAINED WITH ALL UNITS REMOVED FROM MAIN CHASSIS. NO EXTERNAL CONNECTIONS.
6. RESISTANCE MEASUREMENTS ABOVE 3 MEGOHMS INDICATED AS INFINITY (∞).
7. NC INDICATES NO CONNECTION.

TM 5056-34

Figure 34. Main chassis, voltage and resistance diagram.

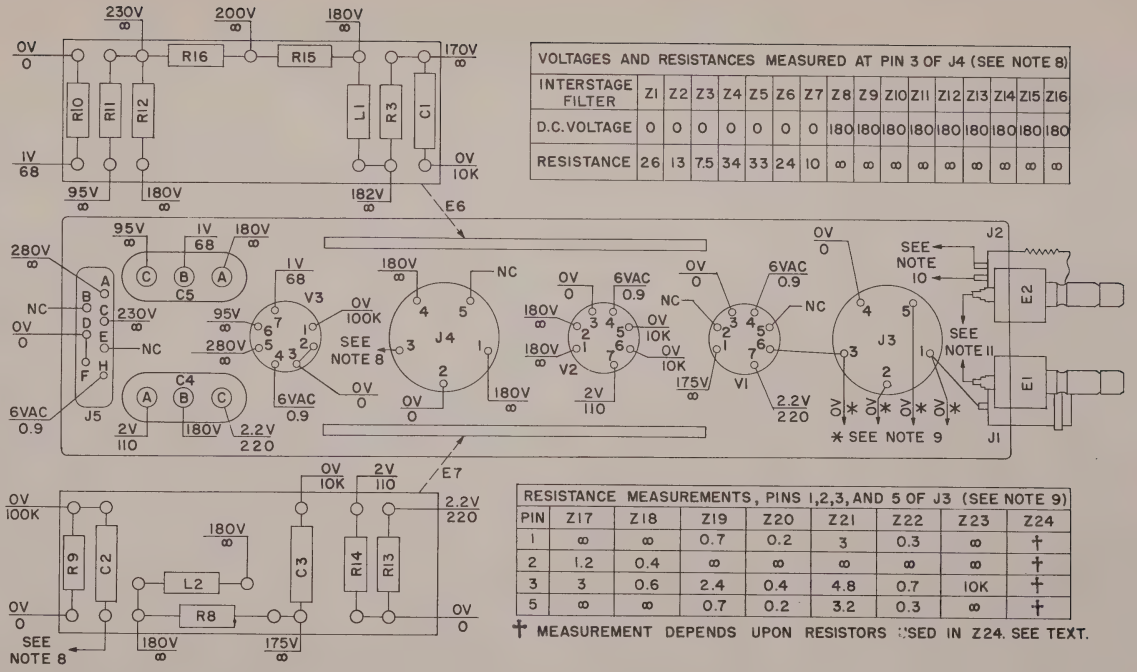


NOTES

1 ALL MEASUREMENTS OBTAINED WITH VACUUM TUBE VOLTMETER.
2 ALL MEASUREMENTS TO GROUND (CHASSIS).
3 ALL VOLTAGES D.C. UNLESS OTHERWISE NOTED.
4 VOLTAGE MEASUREMENTS OBTAINED WITH ALL UNITS CONNECTED AND OPERATING.
5 RESISTANCE MEASUREMENTS OBTAINED WITH OUTPUT AMPLIFIER CHASSIS REMOVED FROM MAIN CHASSIS. NO EXTERNAL CONNECTIONS.
6 RESISTANCE MEASUREMENTS ABOVE 3 MEGOHMS INDICATED AS INFINITY (∞).
7 NC INDICATES NO CONNECTION.
8 * INDICATES MEASUREMENTS WITH UNIT CONNECTED FOR UNBALANCED OUTPUT.
9 ** INDICATES MEASUREMENTS WITH UNIT CONNECTED FOR BALANCED OUTPUT.

TM 5056-35

Figure 35. Output amplifier chassis, voltage and resistance diagram.



VOLTAGES AND RESISTANCES MEASURED AT PIN 3 OF J4 (SEE NOTE 8)																
INTERSTAGE FILTER	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16
D.C. VOLTAGE	0	0	0	0	0	0	0	180	180	180	180	180	180	180	180	180
RESISTANCE	26	13	7.5	34	33	24	10	∞	∞	∞	∞	∞	∞	∞	∞	∞

RESISTANCE MEASUREMENTS, PINS 1,2,3, AND 5 OF J3 (SEE NOTE 9)								
PIN	Z17	Z18	Z19	Z20	Z21	Z22	Z23	Z24
1	∞	∞	0.7	0.2	3	0.3	∞	†
2	1.2	0.4	∞	∞	∞	∞	∞	†
3	3	0.6	2.4	0.4	4.8	0.7	10K	†
5	∞	∞	0.7	0.2	3.2	0.3	∞	†

† MEASUREMENT DEPENDS UPON RESISTORS USED IN Z24. SEE TEXT.

NOTES

1 ALL MEASUREMENTS OBTAINED WITH VACUUM TUBE VOLTMETER.
2 ALL MEASUREMENTS TO GROUND (CHASSIS).
3 ALL VOLTAGES D.C. UNLESS OTHERWISE NOTED.
4 VOLTAGE MEASUREMENTS OBTAINED WITH ALL UNITS CONNECTED AND OPERATING.
5 RESISTANCE MEASUREMENTS OBTAINED WITH INPUT AMPLIFIER CHASSIS REMOVED FROM MAIN CHASSIS NO EXTERNAL CONNECTIONS.
6 RESISTANCE MEASUREMENTS ABOVE 3 MEGOHMS INDICATED AS INFINITY (∞).
7 NC INDICATES NO CONNECTION.
8 VOLTAGE AND RESISTANCE MEASUREMENTS AT PIN 3 OF J4 VARY WITH INTERSTAGE FILTER. SEE TABLE TOP RIGHT OF DIAGRAM.
9 RESISTANCE MEASUREMENTS AT PINS 1,2,3, AND 5 OF J3 VARY WITH R-F TRANSFORMER. SEE TABLE BOTTOM RIGHT OF DIAGRAM.
10 MEASUREMENTS AT TERMINLS OF J2 SAME AS PINS 1 AND 5 OF J3 WHEN UNIT IS CONNECTED FOR BALANCED SHIELDED LINE.
11 MEASUREMENTS AT E1 AND E2 ARE THE SAME AS AT PINS 1 AND 5 OF J3 WHEN THE UNIT IS CONNECTED FOR BALANCED OPEN-WIRE LINE.

TM 5056-36

Figure 36. Input amplifier chassis, voltage and resistance diagram.

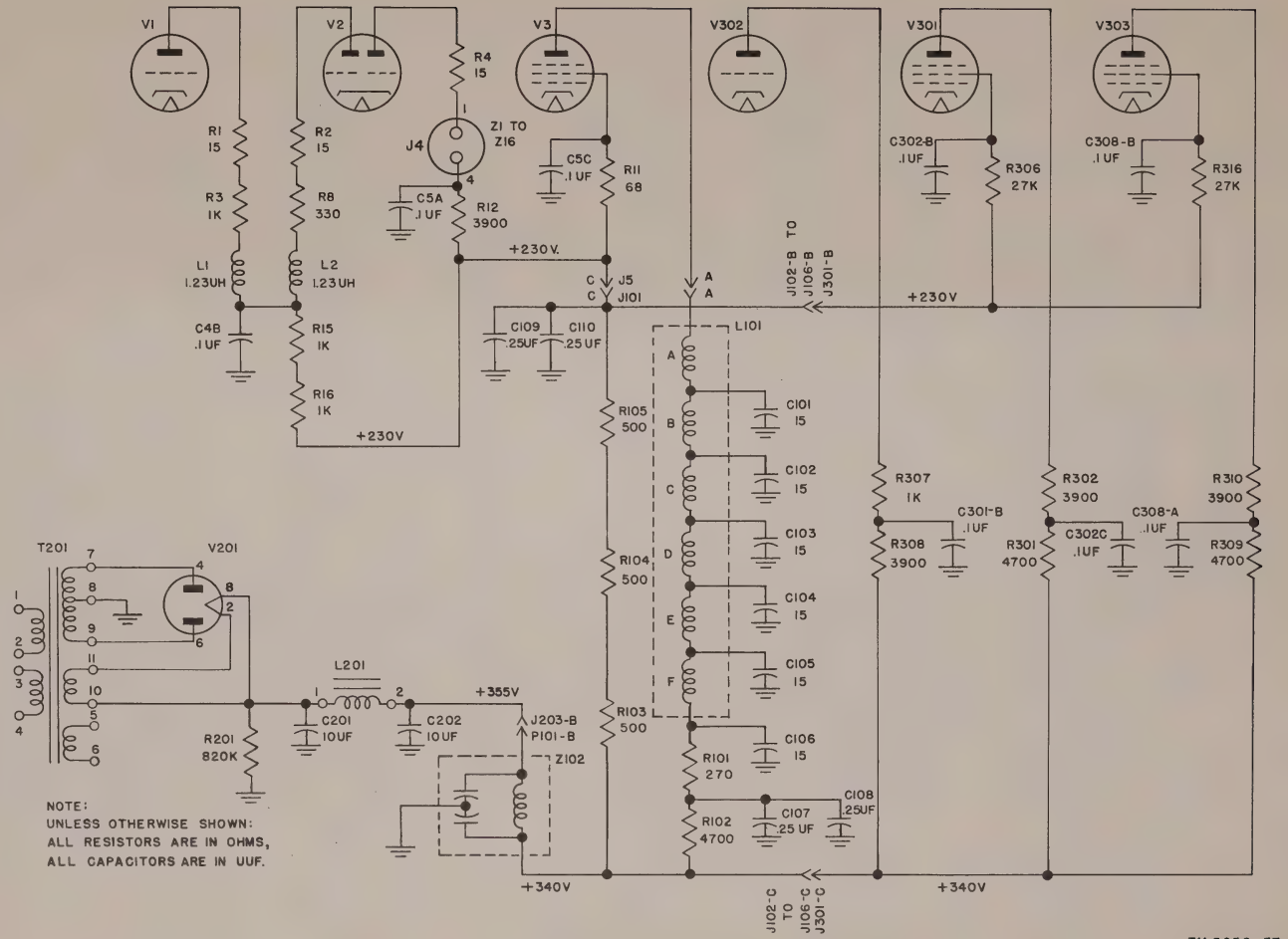
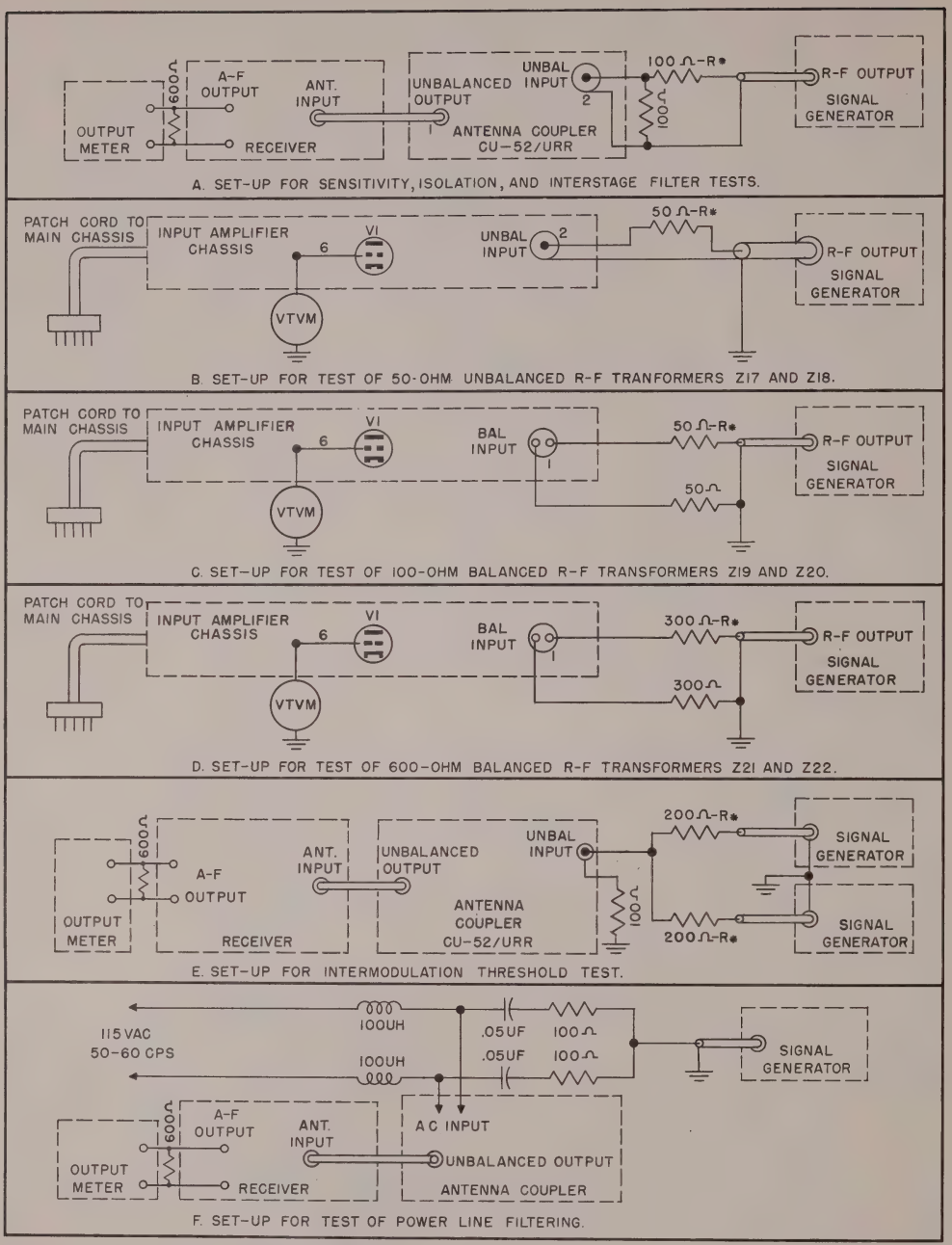


Figure 37. B+ voltage distribution diagram.



*R IS OUTPUT IMPEDANCE OF SIGNAL GENERATOR.

TM 5056-38

Figure 38. Test set-up diagrams.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

82. Disassembly

The following instructions are recommended as a guide for preparing Antenna Coupler CU-52/URR for transportation and storage.

a. Disconnect the antenna transmission line connector and all receiver input connectors.

b. Disconnect the power cord from the power supply chassis receptacle.

c. Remove the four mounting screws which hold the antenna coupler in the rack, and remove the equipment from the rack.

83. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on the material available, and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 13 and reverse the instructions given in that paragraph.

b. Pack each carrying case in a separate crate. Place a dehydrating agent such as silica gel inside the carrying case. Place the carrying case inside a corrugated carton. Line the inside of the carton on all sides with corrugated pads. Seal the carton. Place the carton within a waterproof barrier, and seal the barrier. Piace the package within a nailed wooden crate. Use steel straps around the crate.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

84. General

The demolition procedures outlined in paragraph 85 will be used to prevent the enemy from using or salvaging the equipment. Demolition of the equipment will be accomplished only upon order of the commander.

85. Methods of Destruction

a. SMASH. Smash the controls, tubes, coils, switches, capacitors, and transformers, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. CUT. Cut cables and wiring, using axes, handaxes, or machetes.

c. BURN. Burn cable, resistors, capacitors, coils, wiring, and technical manuals, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. BEND. Bend panel and chassis.

e. EXPLOSIVES. If explosives are necessary, use firearms, grenades, or TNT.

f. DISPOSAL. Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

g. DESTROY EVERYTHING.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310-20-3 and SR 310-20-4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps supply catalog pamphlets.

---

1. Army Regulations

AR 380-5	Safeguarding Military Information.
AR 750-5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Publications

SIG 1	Introduction and Index.
SIG 3	List of Items for Troop Issue.
SIG 5	Stock List of All Items.
SIG 6	Sets of Equipment.
SIG 7 & 8	Organizational Maintenance Allowances and Field and Depot Maintenance Stockage Guide.
SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

3. Publications on Auxiliary Equipment and Test Equipment

TM 11-487A	Radio Receiver R-211-A/U.
TM 11-2627	Tube Testers I-177 and I-177-A.
TM 11-5018IB	Signal Generator TS-588/U.
TM 11-5511	Electronic Multimeter TS-505/U.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TM 9-2851	Painting Instructions for Field Use.

5. Camouflage

FM 5-20	Camouflage, Basic Principles.

6. Decontamination

TM 3-220	Decontamination.

7. Demolition

FM 5-25	Explosives and Demolitions.

8. Other Publications

FM 24-18	Field Radio Techniques.
SR 310-20-3	Index of Training Publications.
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.

SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5 NAV DEPT SERIAL 85P00 AFR 71-4	Report of Damaged or Improper Shipment, (Reports Control Symbols CSGLD-66 (Army), Sand A-70-6(Navy), and AF-MC-U2 (Air Force)).
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedient for Wire and Radio.
TB 11-499-( )[1]	Basic Radio Propagation Predictions.
TM 11-314	Antennas and Antenna Systems.
TM 11-415	Dry Batteries.
TM 11-430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-466	Radar Electronic Fundamentals.
TM 11-483	Suppression of Radio Noises.
TM 11-486	Electrical Communication Systems Engineering.
TM 11-496	Training Text and Applicatory Exercises for Amplitude-Modulated Radio Sets.
TM 11-499	Radio Propagation Handbook.
TM 11-660	Introduction to Electronics.
TM 11-661	Electrical Fundamentals (Direct Current).
TM 11-681	Electrical Fundamentals (Alternating Current).
TM 11-4000	Trouble Shooting and Repair of Radio Equipment.

[1] A new TB in this series is issued monthly which gives propagation predictions three months in advance.

9. Abbreviations

a-c	alternating-current
a-f	audio-frequency
avc	automatic volume control
cps	cycles per second
d-c	direct-current
kc	kilocycle
mc	megacycle
meg	megohm
mw	milliwatt
uf	microfarad
uuf	micromicrofarad
r-f	radio-frequency

APPENDIX II

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7&8, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7&8 CU-52/URR. For an index of available supply catalogs, in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

2. Identification Table of Parts for Antenna Coupling Unit CU-52/URR

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE ASSEMBLY, power: Power Cable Assembly CX-1505/U; electrical; 2 cond, stranded, 16 AWG; synthetic rubber ins; 120" lg o/a; 1 male connector, 1 female connector.	Power cord.	3E7350.1-120.4
	CASE: Antenna Coupler Case CY-1020/URR; coupling unit storage; plywood, olive drab finish; 22-1/2" lg x 11" wd x 22-17/32" h o/a.	For storing Antenna Coupling Unit CU-52/URR.	6F300-1020
	CASE: Electrical Standardized Components Case CY-1021/URR; spare parts storage; plywood, olive drab finish; 29-1/2" lg x 28-1/4" wd x 8-1/32" h o/a.	For storing spare parts.	6F300-1021
	CORD, assembly: Special Purpose Electrical Cable Assembly CX-2095/U; electrical; 7 cond, stranded, #20 AWG, rubber ins individual cond, color coded; 36-9/16" lg o/a; 1 term., plug, male; 1 plug, female.	Patch cord for testing.	3E5999-6.44
	COUPLER, antenna: Antenna Coupler CU-52/URR; transf, R-C coupled; .1 to 24 mc freq range; 115 v/230 v ac, 60 cyc, single ph 1.5 amp, .75 amp oper power requirements; 50 ohms unbalanced, 100/600 ohms balanced high impedance w/dummy input impedance; 270 ohms output; 19 term.; 19" lg x 18" wd x 6-31/32" h o/a dimen.	Couples 1 to 10 radio receivers to single antenna.	2A745-52

3. Identification Table of Parts for R-f Transformers and Interstage Filters

C1201	CAPACITOR, fixed: mica dielectric; 10 uuf ± 10%; 500 vdcw; JAN type CM20B100K.	Part of output circuit of filter Z7.	3K2010021
C1301, C1902, C1901	CAPACITOR, fixed: mica dielectric; 20 uuf ± 10%; 500 vdcw; JAN type CM20C200K.	C1301: Part of filter Z8 series circuit. C1902: Part of filter Z14 output circuit. C1901: Part of filter Z14 input circuit.	
C801, C803	CAPACITOR, fixed: mica dielectric; 27 uuf ± 5%; 500 vdcw; JAN type CM20C270J.	C801: Part of filter Z2 output circuit. C803: Part of filter Z2 input circuit.	3K2027032
C1801, C1802	CAPACITOR, fixed: mica dielectric; 56 uuf ± 5%; 500 vdcw; JAN type CM20C560J.	C1801: Part of filter Z13 input circuit. C1802: Part of filter Z13 output circuit.	3K2056032
C1202, C1203	CAPACITOR, fixed: mica dielectric; 82 uuf ± 5%; 500 vdcw; JAN type CM20C820J.	C1202: Part of filter Z7 series circuit. C1203: Part of filter Z7 input circuit.	3K2082032
C1701, C1702, C2601	CAPACITOR, fixed: mica dielectric; 100 uuf ± 5%; 500 vdcw; JAN type CM20C101J.	C1701 and C1702: Parts of filter Z12 input circuit. C2601: Filter for coil L2601 in Z21.	3K2010132
C1102, C1103	CAPACITOR, fixed: mica dielectric; 120 uuf ± 5%; 500 vdcw; JAN type CM20C121J.	C1102: Part of filter Z6 output circuit. C1103: Part of filter Z6 input circuit.	3K2012132

3. Identification Table of Parts for R-f Transformers and Interstage Filters (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C901	CAPACITOR, fixed: mica dielectric; 130 uuf ± 5%; 500 vdcw; JAN type CM20C131K.	Part of filter Z3 circuit.	
C701, C703	CAPACITOR, fixed: mica dielectric; 150 uuf ± 5%; 500 vdcw; JAN type CM20C151J.	C701: Part of filter Z1 output circuit. C703: Part of filter Z1 input circuit.	3K2015132
C1101	CAPACITOR, fixed: mica dielectric; 270 uuf ± 5%; 500 vdcw; JAN type CM20C271J.	Part of filter Z6 series circuit.	3K2027132
C1601, C1602	CAPACITOR, fixed: mica dielectric; 360 uuf ± 10%; 500 vdcw; JAN type CM20C361K.	Part of filter Z11 input circuit.	
C802	CAPACITOR, fixed: mica dielectric; 470 uuf ± 5%; 500 vdcw; JAN type CM20C471J.	Part of filter Z2 series circuit.	3K2047132
C1002, C1003	CAPACITOR, fixed: mica dielectric; 680 uuf ± 5%; 500 vdcw; JAN type CM30D681J.	C1002: Part of filter Z5 output circuit. C1003: Part of filter Z5 input circuit.	3K3068141
C1501, C1502	CAPACITOR, fixed: mica dielectric; 820 uuf ± 5%; 500 vdcw; JAN type CM30D821J.	C1501: Part of filter Z10 input circuit. C1502: Part of filter Z10 output circuit.	3K3082142
C1001	CAPACITOR, fixed: mica dielectric; 1100 uuf ± 10%; 500 vdcw; JAN type CM30D112K.	Part of filter Z5 series circuit.	
C1401, C1402	CAPACITOR, fixed: mica dielectric; 1600 uuf ± 10%; 500 vdcw; JAN type CM30D162K.	C1401: Part of filter Z9 output circuit. C1402: Part of filter Z9 input circuit.	
C702	CAPACITOR, fixed: mica dielectric; 1800 uuf ± 2%; 500 vdcw; JAN type CM30D182J.	Part of filter Z1 series circuit.	3K3018242
C601	CAPACITOR, fixed: mica dielectric; 2700 uuf ± 5%; 500 vdcw; JAN type CM30D272J.	Coupling between input and output circuits of Z4.	3K3027242
H701	CLAMP, electrical: brass; nickel pl; stud, coil retaining; 3-1/8" lg x 3/16" dia.	Filter coil mounting clamp.	2Z2642.584
L701A, L701B, L701C	COIL, RF: 3 sect.; electrical data A - 26.57 ohms d-c resistance, B - 7.44 ohms d-c resistance, C - 26.57 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a, 8 term.	L701A: Part of filter Z1 input circuit. L701B: Part of filter Z1 series circuit. L701C: Part of filter Z1 output circuit.	3C1084Z109-19
L801A, L801B, L801C	COIL, RF: 3 sect.; electrical data A - 12.84 ohms d-c resistance, B - 3.54 ohms d-c resistance, C - 12.84 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L801A: Part of filter Z2 input circuit. L801B: Part of filter Z2 series circuit. L801C: Part of filter Z2 output circuit.	3C1084Z109-20
L901A, L901B, L901C	COIL, RF: 3 sect.; electrical data A - 8.22 ohms d-c resistance, B - .178 ohms d-c resistance, C - 8.22 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L901A: Part of filter Z3 input circuit. L901B: Part of filter Z3 series circuit. L901C: Part of filter Z3 output circuit.	3C1084Z109-18

L601A, L601B, L601C	COIL, RF: 3 sect.; electrical data A - 35.1 ohms d-c resistance, B - .19 ohms d-c resistance, C - 35.1 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L601A: Part of filter Z4 input circuit. L601B: Part of filter Z4 series circuit. L601C: Part of filter Z4 output circuit.	3C1084Z109-21
L1001A, L1001B, L1001C	COIL, RF: 3 sect.; electrical data A - 32.9 ohms d-c resistance, B - 21.71 ohms d-c resistance, C - 32.9 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1001A: Part of filter Z5 input circuit. L1001B: Part of filter Z5 series circuit. L1011C: Part of filter Z5 output circuit.	3C1084Z109-16
L1101A, L1101B, L1101C	COIL, RF: 3 sect.; electrical data A - 22.9 ohms d-c resistance, B - 15.09 ohms d-c resistance, C - 22.9 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1101A: Part of filter Z6 input circuit. L1101B: Part of filter Z6 series circuit. L1101C: Part of filter Z6 output circuit.	3C1084Z109-17
L1201A, L1201B, L1201C	COIL, RF: 3 sect.; electrical data A - 11.04 ohms d-c resistance, B - 8.14 ohms d-c resistance, C - 11.04 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1201A: Part of filter Z7 input circuit. L1201C: Part of filter Z7 series circuit. L1201C: Part of filter Z7 output circuit.	3C1084Z109-15
L1301A, L1301B, L1301C	COIL, RF: 3 sect.; electrical data A - .273 ohms d-c resistance, B - .244 ohms d-c resistance, C - .273 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1301A: Part of filter Z8 output circuit. L1301B: Part of filter Z8 series circuit. L1301C: Part of filter Z8 input circuit.	3C1084Z109-14
L1401A, L1401B, L1401C	COIL, RF: 3 sect.; electrical data A - 39.1 ohms d-c resistance, B - 28 ohms d-c resistance, C - 39.1 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1401A: Part of filter Z9 output circuit. L1401B: Part of filter Z9 series circuit. L1401C: Part of filter Z9 input circuit.	3C1084Z109-13
L1501A, L1501B, L1501C	COIL, RF: 3 sect.; electrical data A - 33.75 ohms d-c resistance, B - 18.2 ohms d-c resistance, C - 33.75 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a.	L1501A: Part of filter Z10 output circuit. L1501B: Part of filter Z10 series circuit. L1501C: Part of filter Z10 input circuit.	3C1084Z109-11
L1601A, L1601B, L1601C	COIL, RF: 3 sect.; electrical data A - 22.25 ohms d-c resistance, B - 13.5 ohms d-c resistance, C - 22.25 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1601A: Part of filter Z11 output circuit. L1601B: Part of filter Z11 series circuit. L1601C: Part of filter Z11 input circuit.	3C1084Z109-12
L1701A, L1701B, L1701C	COIL, RF: 3 sect.; electrical data A - 17.85 ohms d-c resistance, B - 12.62 ohms d-c resistance, C - 17.85 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1701A: Part of filter Z12 output circuit. L1701B: Part of filter Z12 series circuit. L1701C: Part of filter Z12 input circuit.	3C1084Z109-10
L1801A, L1801B, L1801C	COIL, RF: 3 sect.; electrical data A - 14.42 ohms d-c resistance, B - 10.13 ohms d-c resistance, C - 14.42 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1801A: Part of filter Z13 output circuit. L1801B: Part of filter Z13 series circuit. L1801C: Part of filter Z13 input circuit.	3C1084Z109-7
L1901A, L1901B, L1901C	COIL, RF: 3 sect.; electrical data A - 9.42 ohms d-c resistance, B - 6.17 ohms d-c resistance, C - 9.42 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L1901A: Part of filter Z14 output circuit. L1901B: Part of filter Z14 series circuit. L1901C: Part of filter Z14 input circuit.	3C1084Z109-9
L2001A, L2001B, L2001C	COIL, RF: 3 sect.; electrical data A - 5.66 ohms d-c resistance, B - 4.81 ohms d-c resistance, C - 5.66 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L2001A: Part of filter Z15 input circuit. L2001B: Part of filter Z15 series circuit. L2001C: Part of filter Z15 output circuit.	3C1084Z109-8
L2101A, L2101B, L2101C	COIL, RF: 3 sect.; electrical data A - .95 ohms d-c resistance, B - .74 ohms d-c resistance, C - .95 ohms d-c resistance; copper cond, air core; 2-3/8" lg x 5/8" dia x 1-1/2" h o/a; 8 term.	L2101A: Part of filter Z16 input circuit. L2101B: Part of filter Z16 series circuit. L2101C: Part of filter Z16 output circuit.	3C1084Z109-6

3. Identification Table of Parts for R-f Transformers and Interstage Filters (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
L2201	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z17.	3C1084Z109-5
L2301	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z18.	3C1084Z109-4
L2401	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z19.	3C1084Z109-2
L2501	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z20.	3C1084Z109
L2601	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z21.	3C1084Z109-1
L2701	COIL, RF: copper cond, 2 wdg, torroidal, unshielded, powdered-iron core; 1-1/2" OD x 1" ID x 1/4" dia o/a; 4 term.	Antenna input of transformer Z22.	3C1084Z109-3
J701, J801, J901, J601, J1001, J1101, J1201, J1301, J1401, J1501, J1601, J1701, J1801, J1901, J2001, J2101, J2201, J2301, J2401, J2501, J2601, J2701, J2801, J2901	CONNECTOR, receptacle: 5 rd male cont; pol; straight; 2-1/4" lg x 1-7/8" wd o/a.	J701: Plug-in base of filter Z1. J801: Plug-in base of filter Z2. J901: Plug-in base of filter Z3. J601: Plug-in base of filter Z4. J1001: Plug-in base of filter Z5. J1101: Plug-in base of filter Z6. J1201: Plug-in base of filter Z7. J1301: Plug-in base of filter Z8. J1401: Plug-in base of filter Z9. J1501: Plug-in base of filter Z10. J1601: Plug-in base of filter Z11. J1701: Plug-in base of filter Z12. J1801: Plug-in base of filter Z13. J1901: Plug-in base of filter Z14. J2001: Plug-in base of filter Z15. J2101: Plug-in base of filter Z16. J2201: Plug-in base of transformer Z17. J2301: Plug-in base of transformer Z18. J2401: Plug-in base of transformer Z19. J2501: Plug-in base of transformer Z20. J2601: Plug-in base of transformer Z21. J2701: Plug-in base of transformer Z22. J2801: Plug-in base of transformer Z23. J2901: Plug-in base of transformer Z24.	2Z3025-28
Z1	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, broad, .1 to 1.6 mc.	3Z1892-62.1

Z2	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, broad, .4 to 6 mc.	3Z1892-62.2
Z3	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, broad, 1.5 to 24 mc.	3Z1892-62.3
Z4	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, very broad, .1 to 24 mc.	3Z1892-62
Z5	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectanuglar, metal; 5 pin type term.	Interstage filter, medium, .1 to .4 mc.	3Z1892-62.4
Z6	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, medium, .4 to 1.6 mc.	3Z1892-62.5
Z7	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, medium, 1.6 to 6.4 mc.	3Z1892-62.6
Z8	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, medium, 6 to 24 mc.	3Z1892-62.7
Z9	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, .1 to .2 mc.	3Z1892-62.8
Z10	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, .2 to .4 mc.	3Z1892-62.9
Z11	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, .4 to .8 mc.	3Z1892-62.10
Z12	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, .8 to 1.6 mc.	3Z1892-62.11
Z13	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, 1.6 to 3.2 mc.	3Z1892-62.12
Z14	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, 3 to 6 mc.	3Z1892-62.13
Z15	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, 6 to 12 mc.	3Z1892-62.14
Z16	FILTER, band-pass: 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; cased, rectangular, metal; 5 pin type term.	Interstage filter, narrow, 12 to 24 mc.	3Z1892-62.15
R701, R1001, R1501, R1601, R1701, R1801, R1901	RESISTOR, fixed: comp; 100 ohms ±5%; 1 w; JAN type RC30BF101J.	R701: Part of filter Z1 series circuit. R1001: Part of filter Z5 series circuit. R1501: Part of filter Z10 series circuit. R1601: Part of filter Z11 series circuit. R1701: Part of filter Z12 series circuit. R1801: Part of filter Z13 series circuit. R1901: Part of filter Z14 series circuit.	3RC30BF101J

3. Identification Table of Parts for R-f Transformers and Interstage Filters (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
R801, R1202	RESISTOR, fixed: comp; 160 ohms ±5%; 1 w; JAN type RC30BF161J.	R801: Part of filter Z2 series circuit. R1202: Part of filter Z7 series circuit.	3RC30BF161J
R602	RESISTOR, fixed: comp; 330 ohms ±5%; 1 w; JAN type RC30BF331J.	Part of filter Z4 output circuit.	3RC30BF331J
R1302, R1303, R2102	RESISTOR, fixed: comp; 470 ohms ± 5%; 1 w; JAN type RC30BF471J.	R1302: Part of filter Z8 series circuit. R1303: Part of filter Z8 output circuit. R2102: Part of filter Z16 output circuit.	3RC30BF471J
R702, R802, R902	RESISTOR, fixed: comp; 510 ohms ± 5%; 1 w; JAN type RC30BF511J.	R702: Part of filter Z1 output circuit. R802: Part of filter Z2 output circuit. R902: Part of filter Z3 output circuit.	3RC30BF511J
R1002, R1101, R1203	RESISTOR, fixed: comp; 750 ohms ± 5%; 1 w; JAN type RC30BF751J.	R1002: Part of filter Z5 output circuit. R1101: Part of filter Z6 output circuit. R1203: Part of filter Z7 output circuit.	3RC30BF751J
R2001	RESISTOR, fixed: comp; 910 ohms ± 5%; 1 w; JAN type RC30BF911J.	Part of filter Z15 output circuit.	3RC30BF911J
R1401, R1502, R1602, R1702, R1802, R1902	RESISTOR, fixed: comp; 1000 ohms ± 5%; 1 w; JAN type RC30BF102J.	R1401: Part of filter Z9 output circuit. R1502: Part of filter Z10 grid circuit. R1602: Part of filter Z11 grid circuit. R1702: Part of filter Z12 grid circuit. R1802: Part of filter Z13 grid circuit. R1902: Part of filter Z14 grid circuit.	3RC30BF102J
R601	RESISTOR, fixed: comp; 1500 ohms ± 5%; 1 w; JAN type RC30BF152J.	Part of filter Z4 input circuit.	3RC30BF152J
R2601	RESISTOR, fixed: comp; 2700 ohms ± 5%; 1 w; JAN type RC30BF272J.	Load resistor for L2601 of transformer Z21.	3RC30BF272J
R1301	RESISTOR, fixed; comp; 3900 ohms ± 5%; 1 w; JAN type RC30BF392J.	Part of filter Z8 series circuit.	3RC30BF392J
R901, R1201, R2101	RESISTOR, fixed: comp; 4700 ohms ± 5%; 1 w; JAN type RC30BF472J.	R901: Part of filter Z3 series circuit. R1201: Part of filter Z7 input circuit. R2101: Part of filter Z16 series circuit.	3RC30BF472J
R2301	RESISTOR, fixed: comp; 5600 ohms ± 5%; 1 w; JAN type RC30BF562J.	Load resistor for L2301 of transformer Z18.	3RC30BF562J
E701, E801, E901, E601, E1001, E1101, E1201,	SHIELD, coil: aluminum; rectangular; 2-3/8" lg x 1-15/16" wd x 3-13/32" h o/a.	E701: Protects coil L701 from electrical interference. E801: Shields coil L801. E901: Shields coil L901. E601: Shields coil L601. E1001: Shields coil L1001. E1101: Shields coil L1101.	2Z8302.8

E1301, E1401, E1501, E1601, E1701, E1801, E1901, E2001, E2101, E2201, E2301, E2401, E2501, E2601, E2701, E2801, E2901		E1201: Shields coil L1201. E1301: Shields coil L1301. E1401: Shields coil L1401. E1501: Shields coil L1501. E1601: Shields coil L1601. E1701: Shields coil L1701. E1801: Shields coil L1801. E1901: Shields coil L1901. E2001: Shields coil L2001. E2101: Shields coil L2101. E2201: Shields coil L2201. E2301: Shields coil L2301. E2401: Shields coil L2401. E2501: Shields coil L2501. E2601: Shields coil L2601. E2701: Shields coil L2701. E2801: Protective cover for Z23. E2901: Protective cover for Z24.	
E2202, E2302, E2402, E2502, E2602, E2702, E2802	BOARD, terminal: molded phenolic; 5 term., double screw type; 2-1/8" lg x 1/2" wd x 1/8" thk o/a; two 3/32" dia mtg holes on 1-3/4" mtg/c.	E2202: Terminal mounting of Z17. E2302: Terminal mounting of Z18. E2402: Terminal mounting of Z19. E2502: Terminal mounting of Z20. E2602: Terminal mounting of Z21. E2702: Terminal mounting of Z22. E2802: Terminal mounting of Z23.	3Z770-5.68
Z17	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 50 ohms unbalanced, .1 to 3.5 mc.	2Z9629-450
Z18	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 50 ohms unbalanced, 2.4 to 24 mc.	2Z9629-451
Z19	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 100 ohms balanced, .1 to 3.5 mc.	2Z9629-452
Z20	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 100 ohms balanced, 2.4 to 24 mc.	2Z9629-453
Z21	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 600 ohms balanced, .1 to 3.5 mc.	2Z9629-454
Z22	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; powdered-iron toroid form; 5 pin type term. located on plug-in base.	Input transformer, 600 ohms balanced, 2.4 to 24 mc.	2Z9629-455
Z23	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; 5 pin type term. located on plug-in base.	Input transformer, dummy antenna, .1 to to 24 mc.	2Z9629-456

3. Identification Table of Parts for R-f Transformers and Interstage Filters (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
Z24	TRANSFORMER, RF: unshielded; 2-3/8" lg x 1-15/16" wd x 4" h o/a dimen; 5 pin type term. located on plug-in base.	Dummy input transformer, .1 to 24 mc, high-impedance coupling.	2Z9629-457

4. Identification Table of Parts for Input Amplifier Chassis

C3	CAPACITOR, fixed: mica dielectric; 150 uuf ± 10%; 500 vdcw; molded low-loss bakelite case; JAN type CM20B151K.	Coupling, V2A to V2B.	3K2D15121
C1, C2	CAPACITOR, fixed: mica dielectric; 470 uuf ± 10%; 500 vdcw; JAN type CM20B471K.	C1: V1 to V2 interstage coupling. C2: V2 to V3 coupling.	3K2047121
C4A, C4B, C4C, C5A, C5B, C5C	CAPACITOR, fixed: paper dielectric; 3 sect.; 100,000 uuf ea sect. ±20 %, -10% tol ea sect.; 600 vdcw; 3 term.; mineral oil filled; JAN type CP55B5EF104V.	C4A: V2 cathode bypass. C4B: V1 r-f plate decoupling. C4C: V1 cathode bypass. C5A: Interstage filter decoupling. C5B: V3 cathode bypass. C5C: V3 screen bypass.	3DA100-331
L1, L2	COIL, RF: 1.23 uh, .12 ohms d-c resistance; 20 turns, #30 AWG, 1 wnd, unshielded, powdered-iron core; 11/16" lg x 3/16" dia.	L1: V1 plate load. L2: V2 plate load.	3C1084Z109-23
P1	CONNECTOR, plug: 1 male round cont; straight; 1-31/64" lg x 3/4" dia o/a; mtd on cable.	Cable connection to J1.	2Z308-573
P2	CONNECTOR, plug: 2 male round cont; straight; 2" lg x 27/32" dia o/a; mtd on cable.	Cable connector for J2.	2Z7390-421
J1	CONNECTOR, receptacle: 1 female round cont; straight; 1-3/32" lg x 1" wd x 1" h o/a; 50 ohms nom impedance.	V1 signal input (unbalanced).	2Z308-568
J2	CONNECTOR, receptacle: 2 female round cont; pol; straight; 1" lg x 1" wd x 1" h o/a; 95 ohms nom impedance.	V1 input (balanced).	2Z7390-422
J5	CONNECTOR, receptacle: 7 male round cont; straight; 1-5/8" lg x 1/2" wd x 9/32" h o/a excluding protruding cont.	Input amplifier connection to main chassis.	2Z3027-37
O1	COVER, electrical connector: brass nickel pl; 1-1/16" lg x 27/32" dia o/a; attached by chain; cap w/shorting insert for attmt to UG-422/U receptacle.	Dust cover for J1.	2Z3351-294
E1, E2	POST, binding: brass cap, nickel pl; brass base, nickel pl; 11/16" o/a h of post, above mtg surface, 3/8" OD of post.	Signal input connector, open-wire transmission line.	2C4197C/A1
R1, R2, R4	RESISTOR, fixed: comp; 15 ohms ± 10%; 1 w; JAN type RC30BF150K.	R1: V1 parasitic suppressor. R2: V2A parasitic suppressor. R4: V2B parasitic suppressor.	3RC30BF105K

R10	RESISTOR, fixed: comp; 68 ohms ± 10%; 1 w; JAN type RC30BF680K.	V3 cathode bias.	3RC30BF680K
R14	RESISTOR, fixed: comp; 110 ohms ± 5%; 1 w; JAN type RC30BF111J.	V2 cathode bias.	3RC30BF111J
R13	RESISTOR, fixed: comp; 220 ohms ± 10%; 1 w; JAN type RC30BF221K.	V1 cathode bias.	3RC30BF221K
R8	RESISTOR, fixed: comp; 330 ohms ± 5%; 1 w; JAN type RC30BF331J.	V2A plate load.	3RC30BF331J
R3	RESISTOR, fixed: comp; 1000 ohms ± 10%; 1 w; JAN type RC30BF102K.	R3: V1 plate load.	3RC30BF102K
R15, R16	RESISTOR, fixed: comp; 1000 ohms ± 10%; 2 w; JAN type RC42BF102K.	R15, R16: V1 and V2 B+ voltage dropping.	3RC42BF102K
R12	RESISTOR, fixed: comp; 3900 ohms ± 10%; 1 w; JAN type RC30BF392K.	V2B plate load.	3RC30BF392K
R5, R6, R7	RESISTOR, fixed: comp; 10,000 ohms ± 5%; 1 w; JAN type RC30BF103K.	R5: V1 grid resistor. R6: V2A grid resistor. R7: V2B grid resistor.	3RC30BF103K
R11	RESISTOR, fixed: comp; 33,000 ohms ± 10%; 1 w; JAN type RC30BF333K.	V3 screen dropping.	3RC30BF333K
R9	RESISTOR; fixed: comp; .10 meg ± 5%; 1 w; JAN type RC30BF104J.	V3 grid resistor.	3RC30BF104J
E3, E4, E5	SHIELD, electron tube: nickel pl brass; cylindrical shape; 3/8" dia x 1-3/4" h; fl mtg.	E3: Shields and retains V1. E4: Shields and retains V2. E5: Shields and retains V3.	2Z8304.276
J3, J4	SOCKET, electron tube: 5 phosphor bronze silver pl cont; ceramic body.	J3: Retains input transformer. J4: Retains interstage filter.	2Z8675.29
X1, X2, X3	SOCKET, electron tube: 7 phosphor bronze silver pl cont; miniature size; incl metal shock shield .930" dia x 1-3/8" h; molded plastic body; JAN type TSE7T101.	X1: Retains V1. X2: Retains V2. X3: Retains V3.	2Z8677.171
V1, V2	TUBE, electron: duo triode; glass, RMA envelope T5-1/2; 7 pins; JAN type 6J6.	V1: Input amplifier. V2: Interstage amplifier.	2J6J6
V3	TUBE, electron: pentode; glass, RMA envelope T5-1/2; 7 pins; JAN type 6BA6.	Transmission line amplifier.	2J6BA6

5. Identification Table of Parts for Main Chassis

C101 thru C106	CAPACITOR, fixed: ceramic dielectric; 15 uuf, ± 5%, 500 vdcw; JAN type CC21UJ150J.	Transmission line bypass.	3D9015-59
C107 thru C110	CAPACITOR, fixed: paper dielectric; 250,000 uuf ± 20% - 10%; 600 vdcw; HS metal case; mineral oil filled; type CP53B1EF254V.	B+ decoupling.	3DA250-380

5. Identification Table of Parts for Main Chassis (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
L101	COIL ASSEMBLY, RF: ea sect. 2.07 mh; 10 turns per sect.; #28 AWG, copper cond, enamel covered, 1 six sect. wdg, tapped unshielded.	Artificial transmission line.	3C1084Z109-22
P101	CONNECTOR, plug: 4 male round cont; pol; straight; 2-1/8" lg x 1-15/32" dia o/a; 5/16" dia max cable opening.	Connects noise filter to J203 in power supply.	2Z3024-37
J101 thru J106	CONNECTOR, receptacle: 7 female round cont; straight; 1-5/8" lg excluding protruding cont; 1/2" wd 5/16" h o/a.	J101: Connects to J5 in input amplifier. J102 thru J106: Output amplifier connectors.	2Z3068-31
R101	RESISTOR, fixed: comp; 270 ohms ± 5%; 1 w; JAN type RC30BF271J.	Transmission line termination.	3RC30BF271J
R103, R104, R105	RESISTOR, fixed: WW; inductive wdg; 500 ohms ± 5%; 10 w; JAN type RW31G501.	B+ dropping resistors.	
R102	RESISTOR, fixed: comp; 4700 ohms ± 10%; 1 w; JAN type RC30BF472K.	Transmission line voltage dropping.	
Z102	SUPPRESSOR, electrical noise: capacitor and coil type; 130 vac 1 amp; 1-3/4" lg x 1-1/4" wd x 7/8" h excluding term.; enamel finish; 2 term.; HS metal case.	B+ noise filter.	3Z1891-35.20
Z101	SUPPRESSOR, electrical noise: capacitor and coil type; 130 vac 10 amps; 2" lg x 2" wd x 1-1/8" h o/a excluding term.; rectangular shape, enamel finish; HS metal case.	Filament noise filter.	3Z1891-41.2

6. Identification Table of Parts for Output Amplifier Chassis

C304, C305, C307	CAPACITOR, fixed: mica dielectric; 470 uuf, ± 10%; 500 vdcw; molded low-loss bakelite case; JAN type CM20B471K.	C304: Couples V302 to V301. C305: Couples V3 to V302. C307: Couples V302 to V303.	3K2047121
C303, C306	CAPACITOR, fixed: paper dielectric; 50,000 uuf, ± 20%; 600 vdcw; HS metal case; mineral oil filled; JAN type CP26A1EF503M.	C303: V301 signal output coupling. C306: V303 signal output coupling.	3DA50-292
C301, C302, C308	CAPACITOR, fixed: paper dielectric; 3 sect.; 100,000 uuf ea sect.; + 20%, -10%; 600 vdcw; HS metal case; 3 term. mineral oil filled; JAN type CP55B5EF104V.	C301A: V301, V302, and V303 B+ decoupling. C301B: V302 B+ decoupling. C301C: Output amplifier filament bypass. C302A: V301 cathode bypass. C302B: V301 screen bypass. C302C: V301 B+ decoupling. C308A: V303 B+ decoupling. C308B: V303 screen bypass. C308C: V303 cathode bypass.	3DA100-331

L301, L302	COIL, RF: 2.75 mh, .38 ohm d-c resistance; 35 turns #32 AWG, copper cond, double cotton-covered cond, 1 wdg, unshielded, powdered-iron core, 11/16" lg x 3/16" dia o/a excluding term.; 2 term.	L301: Plate coupling V302 to V301. L302: Cathode coupling V302 to V303.	3C1084Z109-24
P302, P304	CONNECTOR, plug: 1 male, round cont; straight; 1-31/64" lg x 3/4" wd o/a; cable mtd.	P302: Cable connector to J302. P304: Cable connector to J304.	2Z308-573
P303	CONNECTOR, plug: 2 male, round cont; 3 pol; straight 2" lg x 27/32" wd o/a; cable mtd.	Cable connector to J303.	2Z7390-421
J301	CONNECTOR, receptacle: 7 male round cont; straight; 1-5/8" lg x 1/2" wd x 9/32" o/a.	Output amplifier connector to main chassis.	2Z3027-37
J302, J304	CONNECTOR, receptacle: 1 female round cont; straight; 1-3/32" lg x 1" wd x 1" h o/a; 50 ohms nom impedance.	J302: V301 signal output jack. J304: V303 signal output jack.	2Z308-568
J303	CONNECTOR, receptacle: 2 female round cont; pol; straight; 1" lg x 1" wd x 1" h o/a; 95 ohms nom impedance.	V301 and V303 balanced output jack.	2Z7390-422
O-301	COVER: electrical connector; brass; silver pl; 1-1/16" lg x 27/32" dia o/a; attached by chain; cap w/shorting insert for attmt to UG-422/U receptacle.	Shorting cap for J303.	2Z3351-294
R305, R315	RESISTOR, fixed: comp; 120 ohms ± 5%; 1 w; JAN type RC30BF121J.	R305: Cathode bias for V301. R315: Cathode bias for V303.	3RC30BF121J
R313	RESISTOR, fixed: comp; 820 ohms ± 5%; 1 w; JAN type RC30BF821J.	Cathode bias for V302.	3RC30BF821J
R307	RESISTOR, fixed: comp; 1000 ohms ± 10%; 1 w; JAN type RC30BF102K.	V302 plate load.	3RC30BF102K
R302, R308, R310	RESISTOR, fixed: comp; 3900 ohms ± 10%; 1 w; JAN type RC30BF392K.	R302: Plate load V301. R308: B+ dropping V302. R310: Plate load V303.	3RC30BF392K
R301, R309	RESISTOR, fixed: comp; 4700 ohms ± 10%; 1 w; JAN type RC30BF472K.	R301: B+ decoupling V301. R309: B+ decoupling V303.	3RC30BF472K
R304, R306, R314, R316	RESISTOR, fixed: comp; 27,000 ohms ± 5%; 1 w; JAN type RC30BF273J.	R304: Grid resistor V301. R306: Screen dropping V301. R314: Grid resistor V303. R316: Screen dropping V303.	3RC30BF273J
R303, R311	RESISTOR, fixed: comp; .10 megohms ± 10%; 1 w; JAN type RC30BF104K.	R303: V301 output bleeder. R311: V303 output bleeder.	3RC30BF104K
R312	RESISTOR, fixed: comp; .10 megohms ± 5%; 1 w; JAN type RC30BF104J.	V302 grid resistor.	3RC30BF104J
E301, E302, E303	SHIELD, electron tube: nickel pl brass; cylindrical; fl mtg; JAN type TSFOT102.	E301: Shields and retains V302. E302: Shields and retains V301. E303: Shields and retains V303.	2Z8304.276

6. Identification Table of Parts for Output Amplifier Chassis (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
X301, X302, X303	SOCKET, electron tube: 7 phosphor bronze silver pl cont; miniature; includes metal shock shield . 838" dia x 1-3/8" h; molded plastic body ; JAN type TSE7T101.	X301: Retains V302. X302: Retains V301. X303: Retains V303.	2Z8677.94
V301, V303	TUBE, electron: pentode; glass envelope RMA T5-1/2; 7 pins; JAN type 6BA6.	Output amplifiers.	2J6BA6
V302	TUBE, electron: triode; glass envelope RMA T5-1/2; 7 pins; JAN type 6C4.	Phase inverter.	

7. Identification Table of Parts for Power Supply Chassis

C201, C202	CAPACITOR, fixed: paper dielectric; 10 uf ± 10%; 600 vdcw; HS metal case; mineral oil filled; JAN type CP70B1EF106V.	Power supply filters.	3DB10-206
H1	CLAMP, electrical: brass; nickel pl; 1-1/2" dia x 1" h o/a.	Retains V201.	2Z2636-26
J201	CONNECTOR, receptacle: 4 female round cont; straight; 5/16" dia max cable opening.	Connects power supply to panel plug.	2Z3065-11
J202	CONNECTOR, receptacle: 2 male flat cont; straight.	A-c power receptacle.	6Z3150A-2
J203	CONNECTOR, receptacle: 4 female round cont; straight; 5/16" dia max cable opening.	Connects noise filters to power supply.	2Z3065-113
A201, A202	MOUNTING: steel, galv; bracket for JAN D3 capacitor case; JAN type CP07S D3.	A201: Retains C201. A202: Retains C202.	2Z1244-207
L201	REACTOR: filter choke, 1 sect.; 10 h o/a inductance, 225 ma dc; 100 ohms d-c resistance, 1500 v rms test voltage; HS metal case; 4-5/8" lg x 3-3/4" wd x 4-1/2" h o/a.	Power supply filter.	3C557Z6
R201	RESISTOR, fixed: comp; . 82 megohms ± 10%; 1 w; JAN type RC30BF824K.	Filter bleeder.	3RC30BF824K
X201	SOCKET, electron tube: 8 phosphor bronze silver pl cont; std octal socket; molded plastic body.	Retains V201.	2Z8670.33
S201	SWITCH, toggle: DPDT; 5 amp, 125 v dc; phenolic body; JAN type ST22N.	Input voltage selection.	3Z9849.135
T201	TRANSFORMER, power: step-down and step-up; HS metal case; input 115/230 vac, 50/60 cyc, single phase; 3 output wdg, #1 secd 760 v, 255 ma, #2 secd 6.3 v, 5.5 amp, #3 secd 5.0 v, 2.0 amp, #1 secd CT; 5" lg x 4-1/4" wd x 4-3/4" h; 11 term., solder lug type, located on bottom.	Plate and filament voltage source.	2Z9613.739

V201	TUBE, electron: twin diode; glass envelope RMA ST-16; 5 pins; JAN type 5R4WGY.	Full-wave rectifier.	2J5R4WGY

8. Identification Table of Parts for Front Panel

P401	CONNECTOR, plug: 4 male round cont; pol; straight; 1" lg x 1-1/4" dia o/a.	Power control connector.	
F401	FUSE, cartridge: 2 amp, 125 v; time delay 200% for 25 seconds, 300% for 8 seconds; inclosed type, glass body; 1-1/4" lg x 1/4" dia o/a.	A-c line protection.	3Z2602.21
E402	HOLDER, fuse: retainer type; 250 v, 15 amp max; accommodates one 2 - amp 3 AG fuse, cartridge type, 1-1/4" lg x 1/4" dia o/a; black bakelite body.	Retains F401.	3Z3282-42.11
E401	LAMP, incandescent: 6-8 v, 1.5 w, .25 amp; miniature bayonet base; #44 clear white bulb.	Operation indicating.	2Z5927
E403	LIGHT, indicator: lens 1/2" dia, red; 6-8 v, .25 amp; 2" lg x 3/8" dia o/a.	Retains E401.	2Z5991-266
S401	SWITCH, toggle: SPST; 125 vdc, 15 amp, 250 vdc, 6 amp; phenolic body; 1-1/4" lg x 41/64" wd x 1-9/64" h o/a; JAN type JANST42A.	Power switch.	3Z9863-42A.1

9. Identification Table of Parts for Power Cable Assembly

W501	CABLE, power: electrical; 2 cond, #16 AWG, copper, stranded, 65 strands #34 AWG; synthetic rubber insulated cond; round X sect.; .3125" dia o/a.	Power cord.	
P502	CONNECTOR, plug: 2 female double T slot cont; not pol; straight; 2-3/16" lg x 1-1/2" dia o/a; .562" dia max cable opening.	Power cord connector.	6Z3150-5
P501	CONNECTOR, plug: 2 male parallel blades cont; not pol; straight; 1-13/16" lg x 1-1/2" dia.	Power cord connector.	6Z1727

10. Identification Table of Parts for Patch Cord Assembly

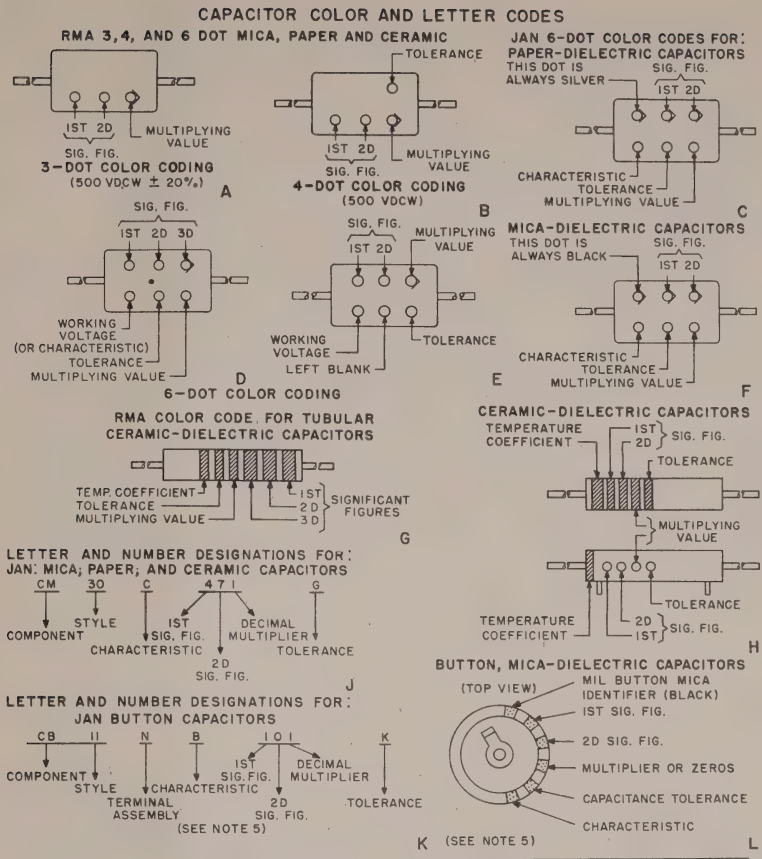
	CONNECTOR, receptacle: 7 female round cont; straight; 1-5/8" lg x 1/2" wd x 5/16" o/a.	Patch cord terminal.	2Z3068-31
	CONNECTOR, receptacle: 7 male round cont; straight; 1-5/8" lg x 1/2" wd x 9/32" h o/a.	Patch cord terminal.	2Z3027-37

INDEX

	Paragraph	Page
A		
Abbreviations	app I, 9	71
Amplifier chassis:		
Input	8b	4
Output	8c	5
Antenna Coupler CU-52/URR:		4
Description	8	
Purpose and use	3	1
System application	4	1
Antenna coupler, theory:		
Antenna input circuits	48	27
Artificial transmission line	47b, 54	25, 36
Block diagram	47	25
Front panel circuits	47f, 60	27, 40
Input amplifier:		
Chassis	47a	25
Stage	50	29
Interstage:		
Amplifier	51	30
Filter	52	30
Noise filter	47e, 59	27, 40
Output amplifier:		
Chassis	47c	27
Stage	56	38
Phase inverter	55	37
Power supply	47d, 58	27, 39
Receiver connections	57	38
R-f transformers	49	27
Transmission line amplifier	53	36
Application, system	4	1
Arctic climates, operation	27	15
B		
Block diagram:		
Antenna coupler	47	25
System	4	1
C		
Cable fabrication:		
Balanced cables	19b	13
C		
Cable fabrication (contd):		
Open-wire line	19d	13
Unbalanced cables	19c	13
Cable:		
Output power	17b	13
Panel	17a	11
Primary	17c	13
Carrying cases, description:		
Antenna Coupler Case CY-1020/URR	9a	5
Electrical Standardized Components Case CY-1021/URR	9b	5
Checking packing case contents	13c	7
Components, table	7	2
Connections, power	15	9
Connections, external:		
Antenna	20a	13
Power	20c	14
Receiver	20b	14
Connections, internal:		
Alternate	15b	9
Normal	15a	9
D		
Daily checks	35	19
Damaged shipment, report	2a	1
D-c resistances, transformers, and coils	69	51
Desert climates, operation	29	16
Domestic shipments:		
Packing	6c	2
Unpacking	13d	7
E		
Export shipments:		
Packing	6	2
Unpacking	13b	7
F		
Field maintenance:		
Final testing	73	57
Repairs	71, 72	55

	Paragraph	Page
F		
Trouble-shooting:		
Chart	67	43
Procedures	61	41
Filter, interstage	8b	4
Forms and records	2	1
Frequency range	5	2
G		
General precautions	65	42
I		
Improper shipment, report	2	1
Inspections, visual	40	22
Installation of:		
Interstage filters	14c	8
R-f transformers	14b	7
Tubes	14a	7
Interstage filter check	81	63
Intermodulation threshold check	78	61
Isolation check	77	59
M		
Main chassis, reversal	16	11
Maintenance:		
Desert	37d	21
Field:		
Final testing	73	6
Repairs	71, 72	55
Trouble shooting	61, 67	41, 43
Organizational:		
Preventive maintenance	32, 33, 35	17, 19
Trouble shooting	41	22
Weatherproofing	37	21
Tropical	37b	21
Winter	37c	21
Measurements:		
D-c resistances, transformer and coils	69	51
Stage gain	70	53
Voltage and resistance diagrams	62	42
Monthly checks	35	19
Mounting, antenna coupler	18	13
O		
Organizational maintenance:		
Preventive maintenance	32, 33, 35	17, 19
Trouble shooting	41	22
Weatherproofing	37	21
Oversea packing	6	2
P		
Packing data	6	2
Patch cords	64	42
Preventive maintenance:		
Definition	32	17
General techniques	33	17
Performing	35	19
Power:		
Input	5	2
Line filter check	79	61
Supply chassis, description	8d	5
Precautions, servicing	65	42
Purpose, equipment	3	1
R		
Refinishing	72	55
Repairs	71, 72	55
Reports:		
Damages or improper shipment	2	1
Unsatisfactory equipment report	2	1
R-f transformer check	78	61
Running spares	10	5
S		
Scope, technical manual	1	1
Sensitivity check	76	59
Service upon receipt of used or reconditioned equipment	21	14
Shorts, checking filament and B+ circuits	66	43
Siting	12	7
Stage gain measurements	70	53
System application	4	1
T		
Technical characteristics	5	2
Testing, final:		
General	73	57
Intermodulation threshold check	78	61
Interstage filter check	81	63
Isolation check	77	59
Power line filter check	79	61
R-f transformer check	80	61
Sensitivity check	76	59
Test:		
Equipment required	74	57
Conditions	75	59

	Paragraph	Page
T		
Transformers:		
D-c resistance	69	51
R-f	8b	4
Tropical climates, operation	28	15
Trouble-shooting,		
Chart	67	43
Data	62	42
Trouble shooting, field maintenance:		
Chart	67	43
Data	62	42
D-c resistance of transformer and coils	69	51
Equipment required	63	42
Filament and B+ circuits	66	43
Precautions	65	42
Procedures	61	41
Signal substitution method	68	51
Use of patch cords	64	42
Trouble shooting, organizational:		
Scope of organizational	39	22
Trouble shooting, organizational (contd):		
Using equipment performance checklist	41	22
Visual inspection	40	22
Tubes, location	14	7
Tube socket voltages and resistance	62	42
U		
Uncrating	13	7
Unpacking	13	7
V		
Visual inspection	40	22
Voltage and resistance diagrams	62	42
Voltage change-over switch	23	15
W		
Weatherproofing	37	21
Weekly checks	35	19
Weight, equipment	5	2



- STANDARDS -					JAN MICA-CM		JAN PAPER-CM		JAN CERAMIC-CC					
									CAP. TOL. FOR MORE THAN 10 UUF			CAP. TOL. FOR 10 UUF OR LESS		
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	% TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	UUF	LETTER DESIG-NATION	CHARAC-TERISTIC
BLACK	0	1	±20	500	M	A	M	A	1	±20	M	±2.0	G	C
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-	H
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-	L
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	±0.5	D	S
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	±0.25	C	B
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	±1.0	F	SL
GOLD	-	0.1	± 5	1,000	J	-	-	-	-	-	-	-	-	A
SILVER	-	0.01	±10	2,000	K	-	K	-	-	-	-	-	-	-
NO COLOR	-	-	±20	500	-	-	-	-	-	-	-	-	-	-
* THE TOLERANCE OF THIS CAPACITOR IS ±30%, NOT ±3%														

NOTES

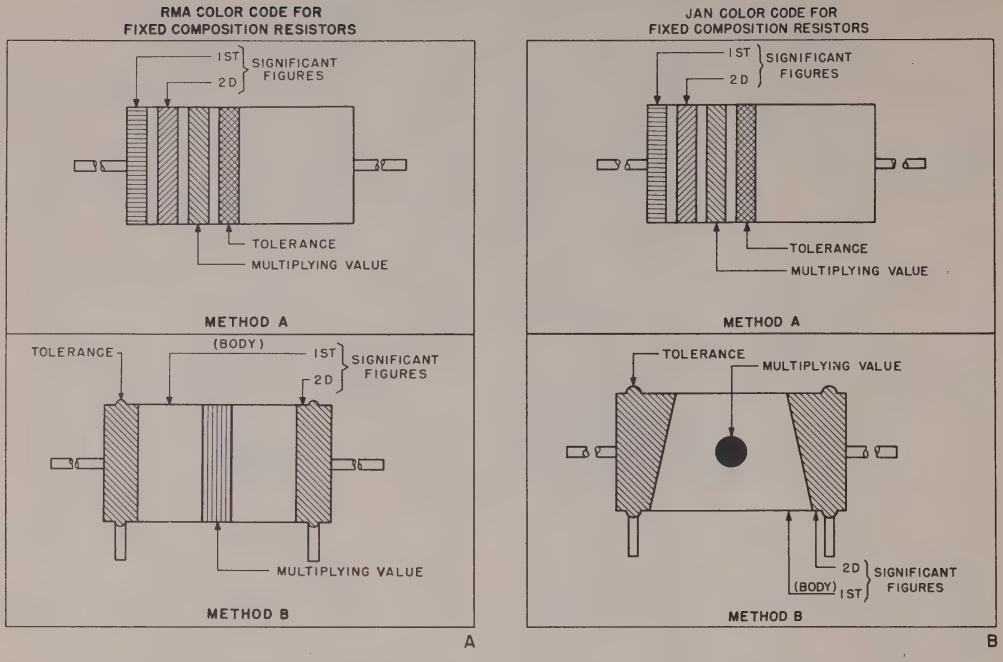
JAN: JOINT ARMY-NAVY
RMA: RADIO MANUFACTURERS ASSOCIATION

1. THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
2. THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
3. CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
4. BUTTON CAPACITORS ARE GENERALLY 300 VDCW
5. READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
6. CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
7. THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
   CB. MICA BUTTON: *CC* CERAMIC; *CM* MICA MOULDED: *CN* PAPER MOULDED

TM CC

Figure 39. Capacitor color and letter codes.

RESISTOR COLOR AND LETTER CODE



STANDARDS				
COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	—	—
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	—
YELLOW	4	10,000	± 4	—
GREEN	5	100,000	± 5	—
BLUE	6	1,000,000	± 6	—
VIOLET	7	10,000,000	± 7	—
GRAY	8	100,000,000	± 8	—
WHITE	9	1,000,000,000	± 9	—
GOLD	—	0.1	± 5	J
SILVER	—	0.01	±10	K
NO COLOR	—	—	±20	M

NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY - NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 40. Resistor color and letter codes.

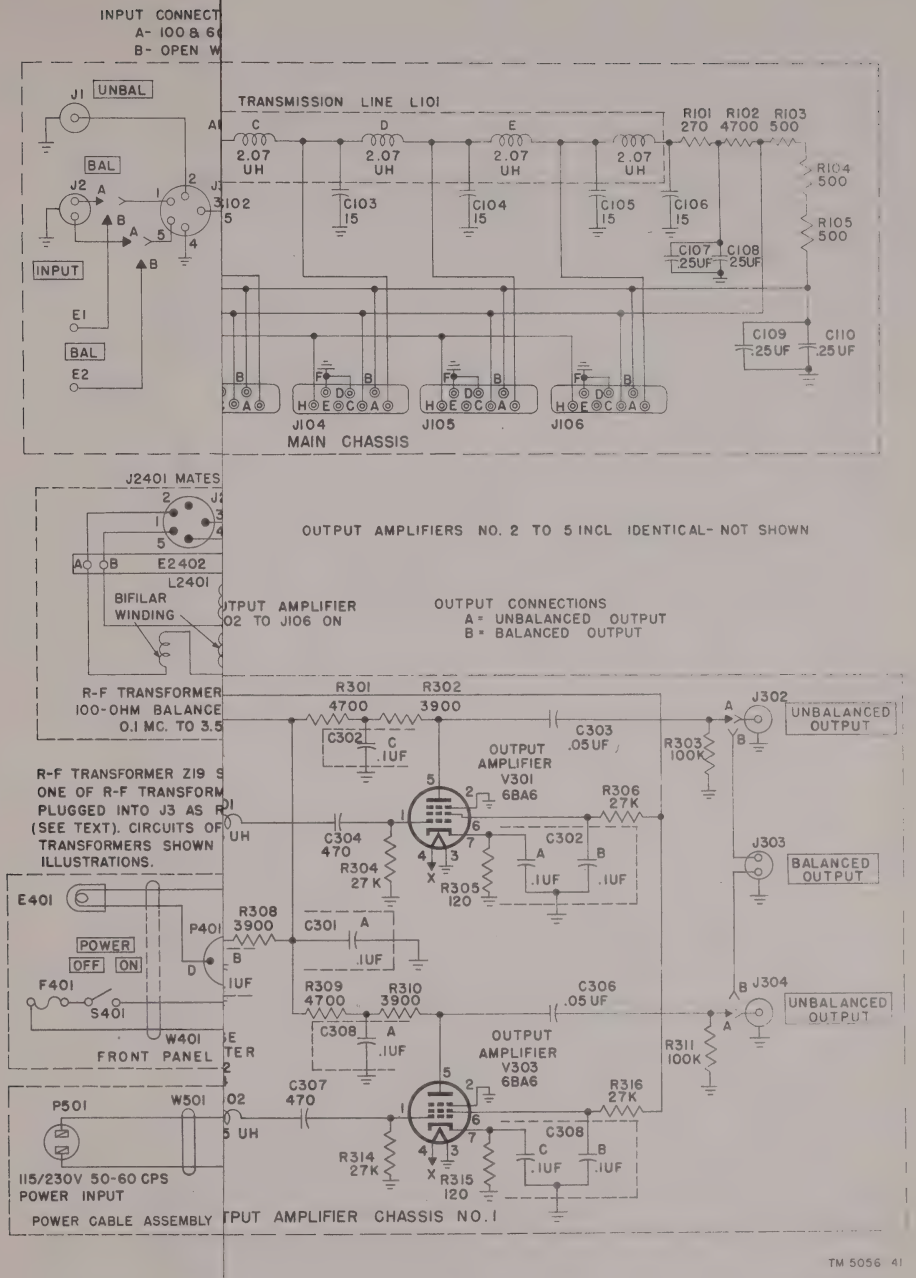
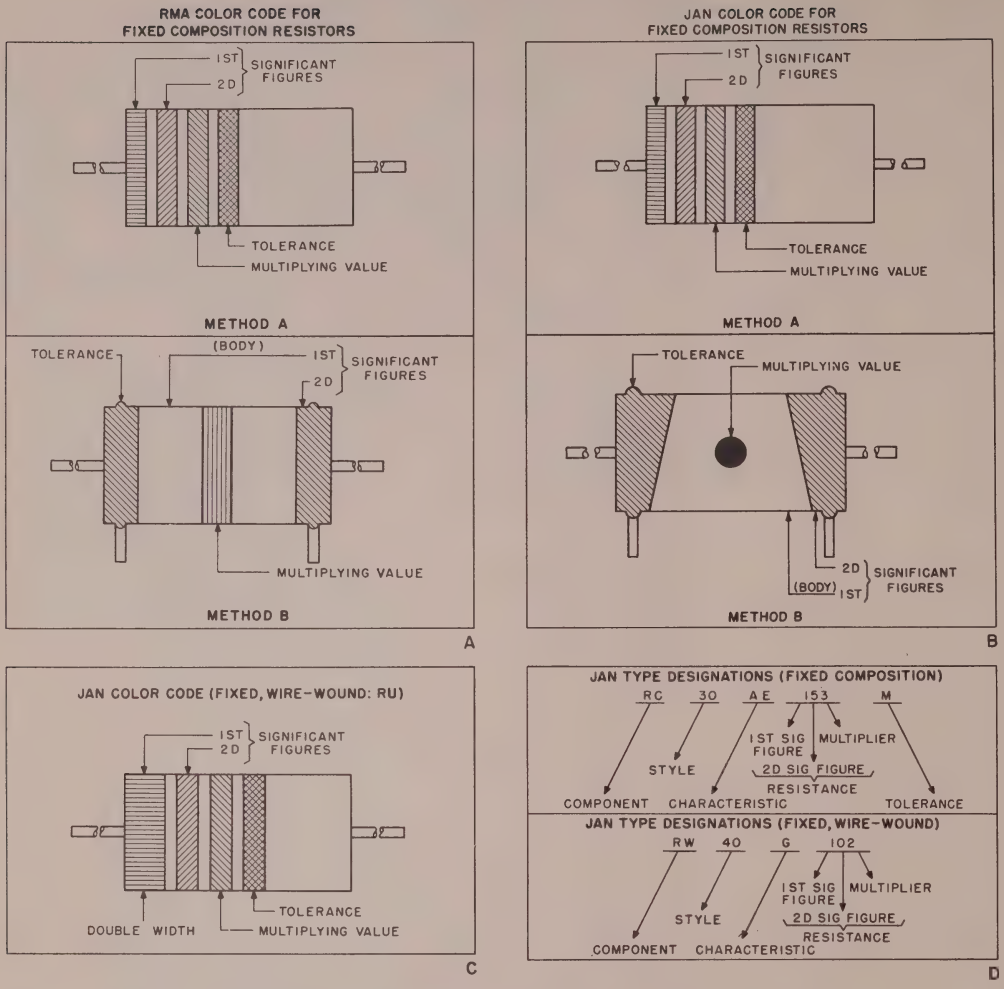


Figure 41. Antenna Coupler CU-52/URR, schematic diagram.

RESISTOR COLOR AND LETTER CODE



STANDARDS				
COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	—	—
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	—
YELLOW	4	10,000	± 4	—
GREEN	5	100,000	± 5	—
BLUE	6	1,000,000	± 6	—
VIOLET	7	10,000,000	± 7	—
GRAY	8	100,000,000	± 8	—
WHITE	9	1,000,000,000	± 9	—
GOLD	—	0.1	± 5	J
SILVER	—	0.01	±10	K
NO COLOR	—	—	±20	M

NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY-NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 40. Resistor color and letter codes.

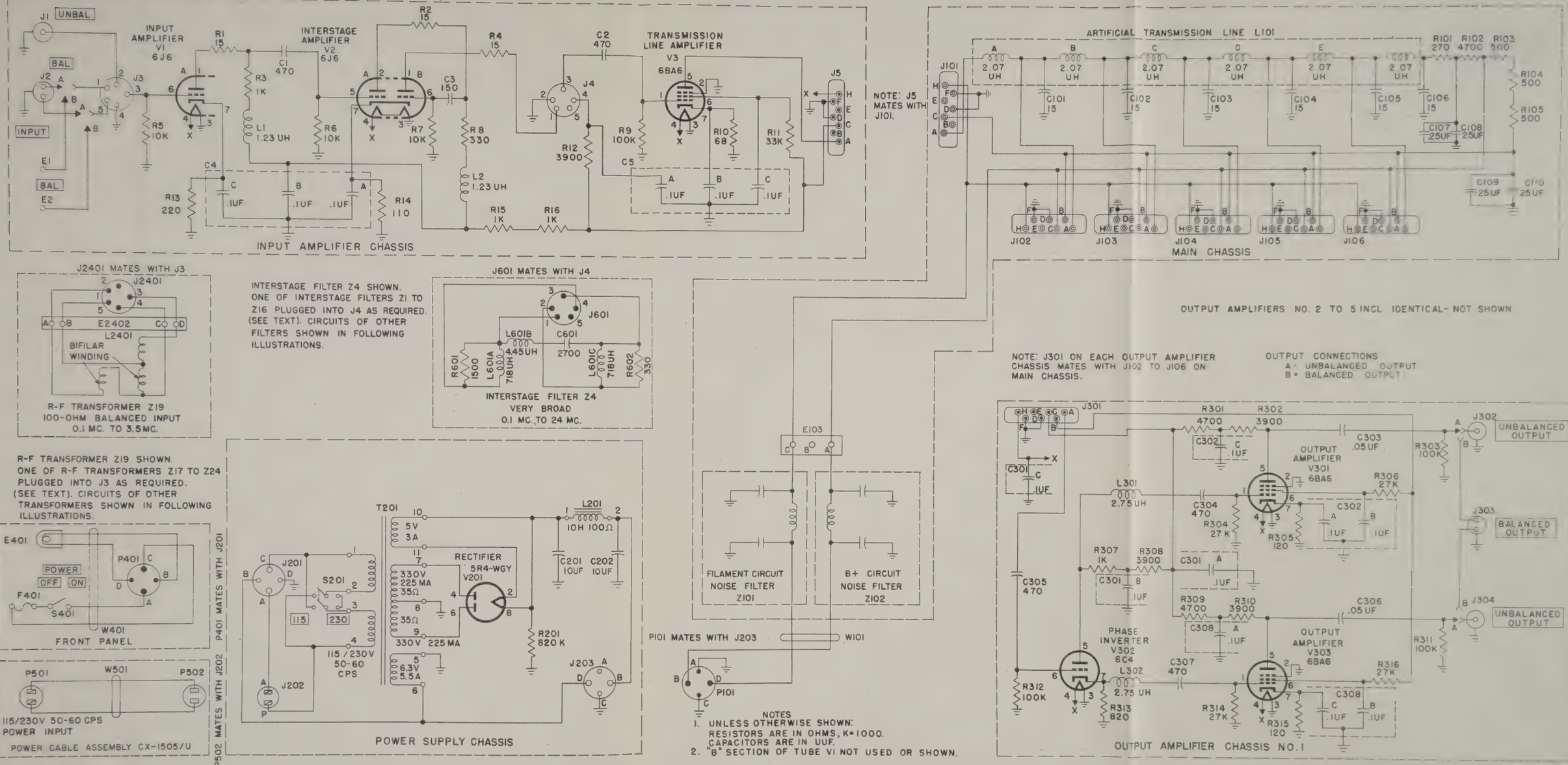
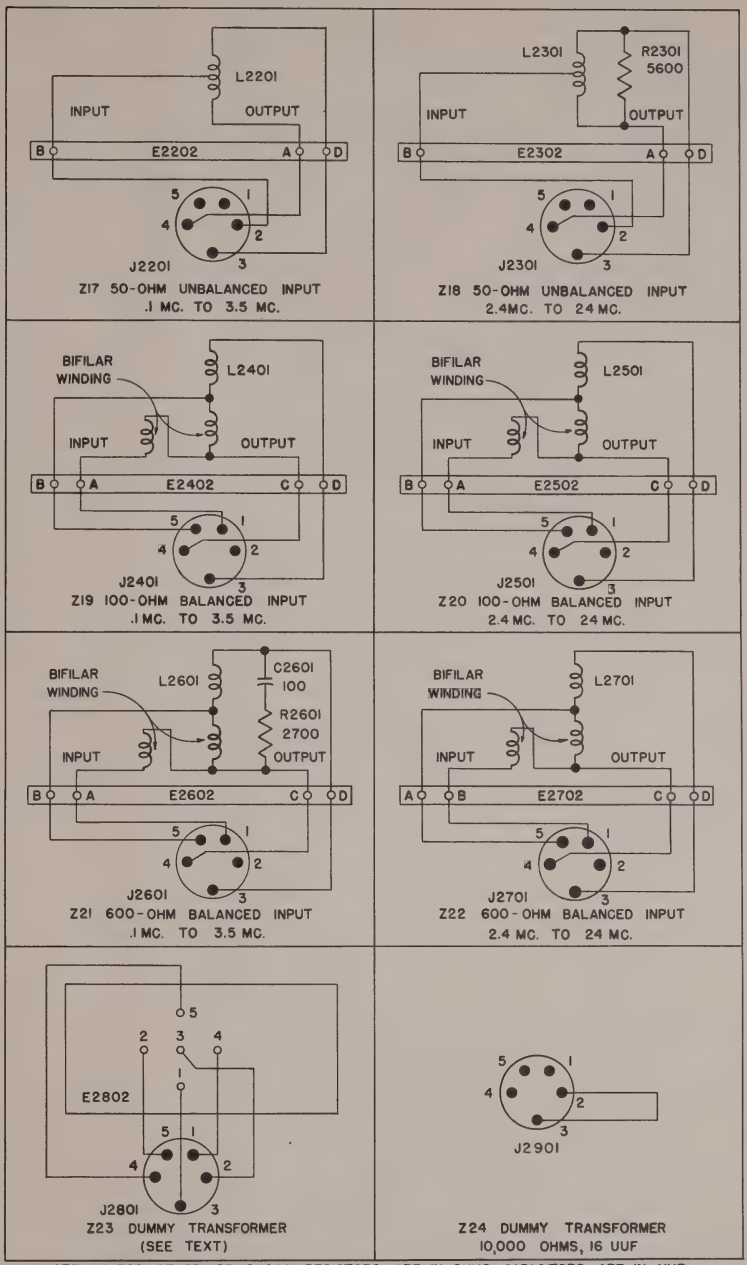


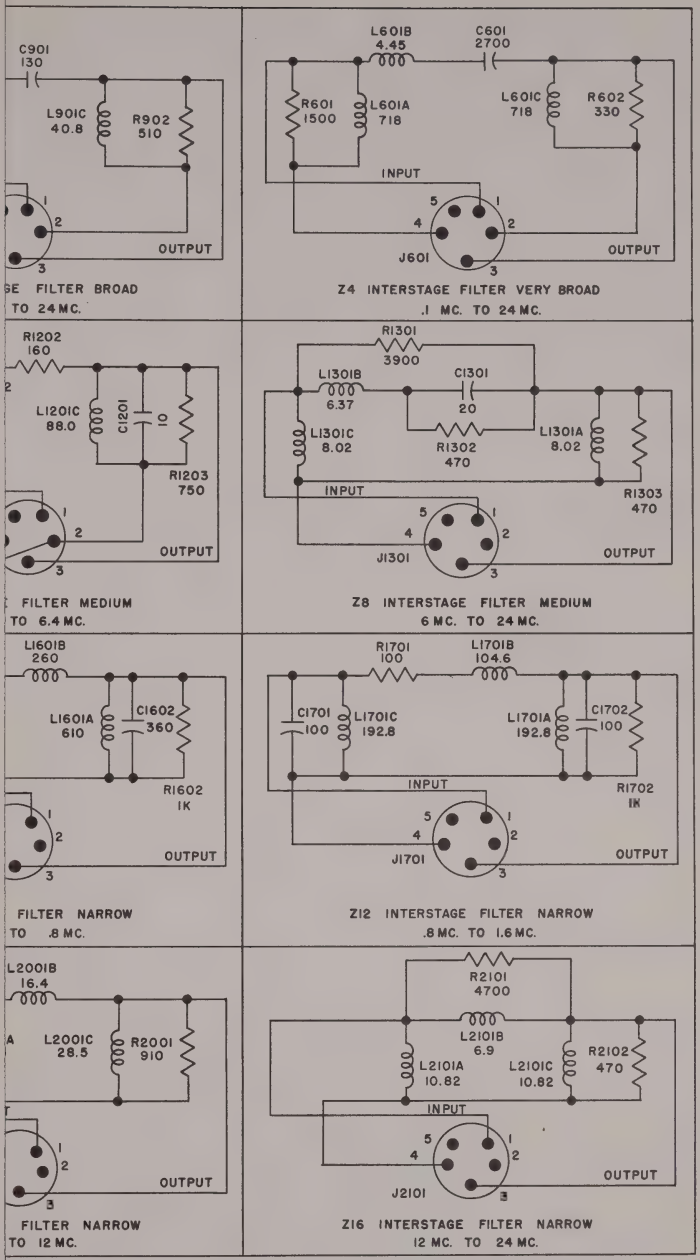
Figure 41. Antenna Coupler CU-52/URR, schematic diagram.



NOTE. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF, INDUCTANCES ARE IN UH.

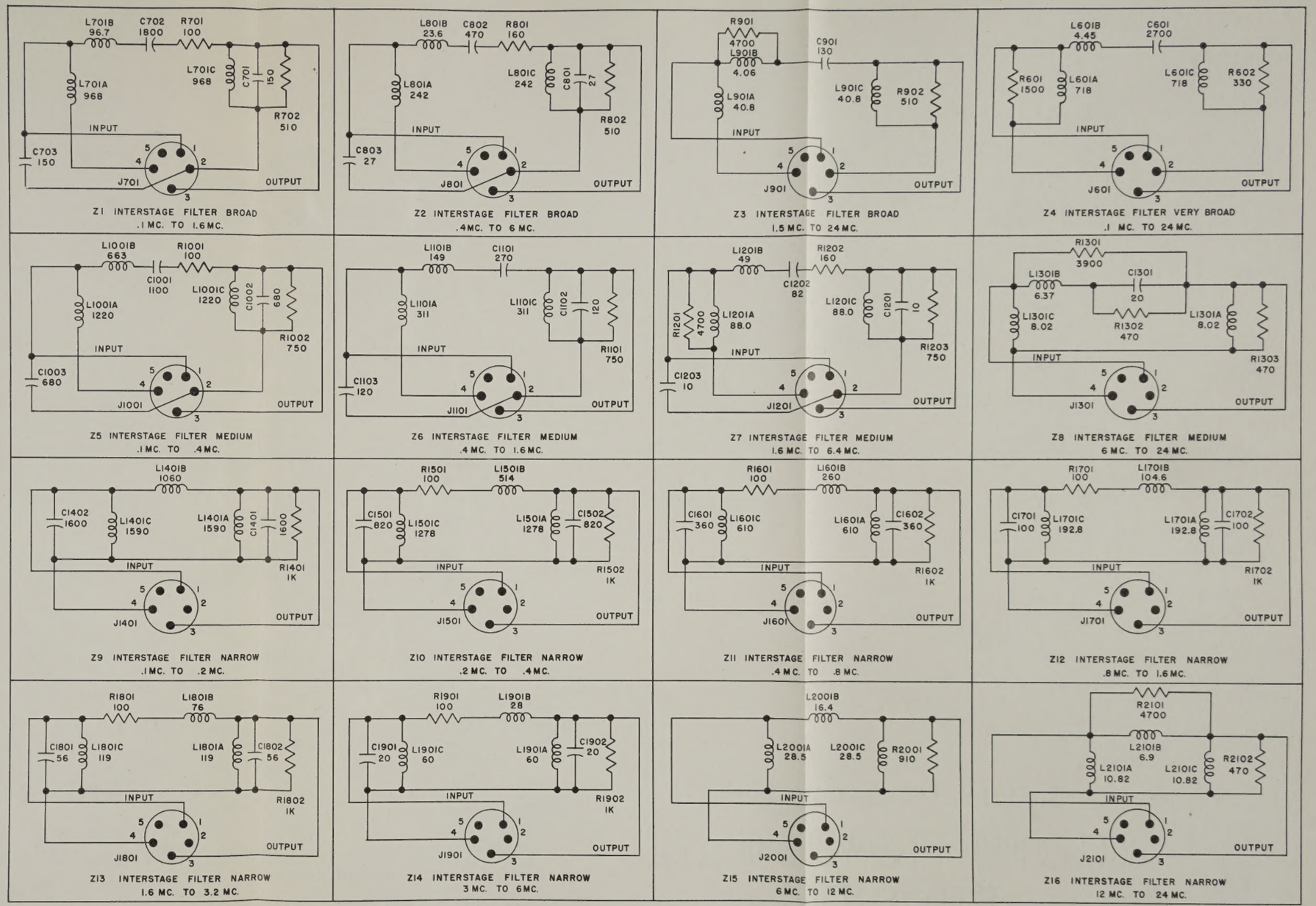
TM 5056-42

Figure 42. R-f transformers, schematic diagrams.



TM 5056–43

Figure 43. Interstage filters, schematic diagrams.



NOTE: UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF, INDUCTANCES ARE IN UH.

TM 5056-43

Figure 43. Interstage filters, schematic diagrams.